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6 March 1986

West Europe Report

SCIENCE AND TECHNOLOGY

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CONTENTS

ADVANCED MATERIALS

FRENCH CERAMICS DESIGNED FOR HERMES

Paris L'USINE NOUVELLE in French 14 Nov 85 p 143

[Article by Pierre Laperrousaz: "Ceramic-Ceramic Composites Aim at Space"]

[Text] Combining resistance to high temperatures with superior mechanical properties, ceramic-ceramic composites could well interest the Hermes space shuttle manufacturers.

It is possible that ceramic-ceramic composites will be used on the Hermes space shuttle to protect it against the very high temperatures (1,400 to 1,700 degrees C) resulting from reentry into the atmosphere. This is, at least, what SEP [European Propulsion Company] has proposed to the two shuttle manufacturers, Aerospatiale and Dassault. The material under consideration is part of the Cerasep line studied by SEP for over 10 years. It is a composite with a silicon carbide (SiC) matrix reinforced by silicon carbide fibers. It would be used to manufacture the parts of the shuttle under the most stress: the nose, the leading edges of the wings, the stabilizers, and even the under-wing panels and lifters.

These parts would play the dual role of both structural and heat protective components. This would distinguish Hermes from the American shuttle, which is actually protected by a heat shield of ceramic tiles or fibrous panels mounted on a conventional metal strucutre.

SEP has already manufactured several samples to prove the validity of its technique. It involves panels measuring 50 mm to 600 mm per side and about 10 mm thick whose structure resembles corrugated cardboard. Both surfaces, as well as the corrugation in between, are made of SiC fiber tissues. Initially, they are put together "dry," which results in a frame. This frame is then impregnated by the so-called Chemical Vapor Infiltration (CVI) process. This process consists in depositing silicon carbide, produced by thermal decomposition of a gas, onto the reinforcing tissue. The operation takes place in a furnace in which the gas is kept circulating at about 1,000 degrees C under reduced pressure.

Because the material of which the matrix is made is introduced as a gas, this operation takes a long time, especially when one tries to obtain very high densities. At this moment the size of the parts seems to be limited only by the size of the industrial tools available.

For these parts and for other parts developed previously, such as compressor wheels or turbojet flaps, SEP has used SiC Nicalon fibers from Nippon Carbon (Japan), until now the only supplier in the world.

It is in this context that SEP has announced a draft agreement with Rhone-Poulenc for joint production of silicon carbide fibers. A task force has been set up and is to present a preliminary report on the conditionns for such an association by the end of the year.

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AEROSPACE

FRANCE AWAITS FRG DECISION ON HERMES: CNES LETS CONTRACTS

Bonn Delays

Paris LES ECHOS in French 9 Jan 86 p 8

[Article by Didier Pavy; first paragraph is LES ECHOS introduction; boxed material follows end of main article]

[Text] At the year's first Franco-German working meeting, the FRG persisted in remaining evasive on the subject of its possible participation in the Hermes program. With 2 months of delay already accrued in the timetable as initially planned by the CNES [(French) National Center for Space Studies], the organizing of the industrial prime contractorship for the space plane is about to be completed at Aerospatiale. By February, therefore, the German authorities would need to respond regarding the funding of the initial developmental studies being proposed to their industrialists--pending the negotiation of the three major space programs--Ariane 5, Columbus and Hermes--within the ESA [European Space Agency] starting in 1987.

From summit meetings to bilateral working sessions, the question of the FRG's participation in the French Hermes space plane project is present in all discussions between Bonn and Paris, but it remains without response throughout. France continues to assert loudly and clearly that, technologically and financially, she can design and build Hermes without her principal European partner.

But she persists in her desire to not do so: It is a matter of Community political and technological cohesion and coherence. Would the Eureka program not be at risk, in the circumstance, of losing a sizable part of its substance?

However, the time has now come to undertake the first phase of the Hermes program; namely, that of the preliminary studies.

The section especially put together by Aerospatiale, the program's industrial prime contractor, will be ready to go into action within some 10 days, at which time initial negotiations with the industrialists concerned can start. Thirteen European countries have already expressed their interest in participating. Several German firms, MBB foremost

among them, have also shown themselves lured by the program's attractiveness... But they will not be able to take part in the negotiation unless they have a governmental guarantee of funding for the corresponding developmental studies. This, of course, offers France an initial means of exerting pressure to speed up the German decision.

Columbus Project Delay

The Europeanization of the program under the ESA this year should also enable Paris to negotiate, beginning around the start of 1987--and within the terms of reference of a package consisting of Ariane 5, Columbus and Hermes--her participation in the orbital platform with due regard for Bonn's intentions as to Hermes. Thus, Frederic d'Allest, general manager of CNES, also finds reason to be optimistic that the FRG will eventually join the Hermes program in his feeling that this evanescent partner will be caught between the jaws of a vise that is at the same time industrial and political.

Politics is certainly what is delaying Bonn's decision. The West German minister of research, Heinz Riesenhuber, devotes his time to defusing any and all reports that would tend to indicate that Germany wants no part of Hermes.

His colleague in Finance, Hans Genscher, spends his time reasserting that he hasn't a penny in his coffers to allocate to Hermes. Pragmatic as they are--having chosen to give priority to scientific and industrial space programs--the Germans have perhaps been disappointed in their "Atlanticism" upon learning that the realization of the U. S. orbital station will be delayed between 12 and 18 months because of insufficient funding.

NASA will be receiving, this year, only half of the $580 million it had planned to allocate to this project.

The urgent need of funding for the Columbus project--the European component of the American space station--could be less pressing. It could provide Germany the opportunity to abandon its budgetary pretext and hasten to join the Hermes camp before it is too late to do so.

The future of the space plane cannot, in any case, be left tied indefinitely to Bonn's wait-and-see policy.

[Boxed material]: A 13.6-Billion-Francs Space Plane

Estimated Cost of Hermes Program in Millions of Francs

--Technological program	544
--Development of space plane	8,840

[Tabulation continues on next page]

[Estimated costs cont'd]:

--Development of ground segment	8,840
--Industrial architecture	1,360
--Payload preparation equipment	408
--Adaptation of Ariane 5 rocket	408
Total	13,600

Estimated Cost of Operations

This estimate is based on the objective of two flights per year. It includes fixed costs (maintenance and labor) and the expenses specific to the two flights (new Ariane 5 for Hermes and fitting out of the space plane for its mission...):

= Fr 1,496 million

for each additional mission:

= Fr 544 million.

Participation

Contemplated distribution of European shares in the development of the program (to be based on industrial negotiations):

Austria	1.5 percent
Belgium	7 "
Denmark	1 "
France	50 "
Germany	15 "
Ireland	0.6 "
Netherlands	5 "
Italy	13 "
Spain	4 "
Sweden	4 "
Switzerland	2 "
United Kingdom	4 "
Norway	? "
Canada	? "
Total	107.1 percent

Note: Countries having less than a 5-percent share will have no design responsibilities.

French Companies Vie for Contracts

Paris LES ECHOS in French 9 Jan 86 p 8

[Article by Honore Berard: "Pechiney's Industrial Response"]

[Text] A few weeks from now, Aerospatiale and Avions Marcel Dassault-Breguet Aviation, both prime contractors for the Hermes program, will have to choose the "second-string contractors" who will participate in the building of the European space minishuttle, whose initial launching is targeted for 1995. Pechiney is pressing its candidacy as a manufacturer of space equipment.

"We are prepared to respond to the aeronautics, space, armaments and transport demand market," we are reminded by officials of the departments and subsidiaries of the group headed by Bernard Pache. They base their affirmation on solid arguments. First of all, technical ones. The research and development they have conducted over the past several years (aluminum represents no more than 56 percent of their revenues, which total Fr 35 billion annually) has centered on industrialization of space materials.

And secondly, strategic ones. Pechiney's investments in both research and development are part of a diversified dynamic that places Pechiney in a position of world leadership. An example is that of lithium aluminum production. For 2 years, Pechiney compined and funded the efforts of one-third of the researchers and technical staff of its Voreppe center, who, working with a 150-kg pilot unit, then with a 1,500-kg industrial prototype, developed a lithium-aluminum alloy resulting in weight-reduction gains of up to 10 percent relative to the materials and alloys previously used in aeronautical and space vehicles. This strategy has led to an industrial phase and a production unit that is to be installed at Issoire. The (newly created) company Pechiney-Aluminium-Lithium, representing an investment of Fr 300 million, will produced 3,500 tons/year of the new alloy in 1988, and 12,500 tons/year in due time.

"We can thus respond," Jean-Sebastien Letourneur, the company's manager, points out, "to the French demand initially, then, rapidly, to 50 percent of European demand plus a substantial portion of that of the American market." The metallurgy of the new alloy will be carried out under argon in the Issoire plant. The pouring will be remotely manipulated and controlled, and the recycling of the lithium scrap will also be done in a controlled atmosphere.

This Pechiney response is by nature a part of the Hermes, Ariane 5 and Columbus orbital station programs. Ceramics as a thermo-mechanical material appear also to be suitable for use in space as a coupling material. In its labs and shops at Trappes and Jarrie (Isere), where 12 percent of the firm's revenues are being devoted to research and development, ceramics are being produced for heat shielding, propulsion systems and as a coupling component for space electronics.

Carbone-Lorraine, a Pechiney subsidiary to the extent of 49 percent (Fr 1.3 billion of consolidated revenue, 53 percent of which is from exports), contributes its know-how to the space programs, notably with a heat shield for the nose cone and leading edges of the minishuttle wings, and particularly a carbon-carbon shield against oxidation, like the one that has been used to date on ballistic missiles. Larger ovens will be put into service in the Gennevilliers plant by mid-1986, to be used in this development of research results and intensified drive towards industrialization.

With sights set on the vast space market, Pechiney is asserting itself as a manufacturer of materials of the future, and is seeking to occupy a position as a second-string industrial supplier. SEP [European Propellant Company] also covets a position in the domain of composites. In this competitive situation, the group led by Bernard Pache could niches tailored to its specific capabilities.

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AEROSPACE

BRIEFS

VOLVO SPACE LAUNCHER PROJECT--The steadily growing Ariane family of launchers may soon beget a bevy of mini-Arianes. Sweden's Volvo company is currently studying a proposed Ariane-derived rocket that would have the capability of launching satellites weighing up to approximately 500 kilograms. This is certainly not a heavy payload, but Volvo officials estimate there is a potential market for such vehicles to launch scientific satellites. What is more, these satellites could be launched from the Swedish base at Kiruna above the Artic Circle. The proposed rocket has already been given a name, Mariane, with the letter "M" standing for "mini". [Text] [Paris SCIENCES & AVENIR in French Dec 85 p 10] 8041/9869

NEW ENGINES FOR ARIANE 4--SEP (European Propellant Company) recently completed the assembly and check-out of a new set of engines for Ariane 4, a more powerful version of the European launch vehicle. Ariane 4 is expected to make its first flight in August 1986. The initial set of these engines is actually a first-stage propulsion bay of eight engines, four of which are strap-on boosters. This set was turned over at Vernon on 29 October to officials of CNES, the French space agency responsible for Ariane launches from French Guiana. Ariane 4's increased lift capability will enable it to place 4,300-kilogram satellites--instead of the current version's 2,500-kilogram payload--into geostationary transfer orbit (altitude of 36,000 kilometers). As a result, it will be possible to "modulate" Ariane's missions according to the size of the payloads its customers will ask it to carry into space. In its heavy version, Ariane 4 can have 10 engines, eight of them on its first stage. For this purpose, the first stage will be stretched 7 meters so as to carry a greater supply of fuel and thereby appreciably increase engine burn-time. SEP officials plan to produce some 50 Ariane 4 propulsion bays in the coming years, while, at the same time, developing the next-generation launch vehicle, namely Ariane 5. The latter will be a heavy-lift launcher capable of carrying a 5-ton payload into orbit. It will, of necessity, incorporate new technologies and could be used to launch the future European space shuttle Hermes. [Text] [Paris AFP SCIENCES in French 31 Oct 85 pp 32-33] 8041/9869

AUSTRIA, NORWAY IN ESA--Austria and Norway have been admitted as full members of the ESA [European Space Agency], according to a 25 October announcement by the agency's headquarters. Both countries had been associate members since 1981. The upgrading of their membership to the status of full member was unanimously approved at the ESA council's 71st meeting which adjourned on the evening of 24 October. The admission of Austria and Norway raises the agency's number of full member nations to 13. Other full members are the Federal Republic of Germany, Belgium, Denmark, Spain, France, Iceland, Italy, Netherlands, United Kingdom, Sweden, and Switzerland. The ESA announcement stated that the council's decision "strengthens the already close ties between the ESA and these two countries associated for the past 20 years in numerous agency programs such as Spacelab (orbital laboratory), Marecs (maritime satellite), and ERS-1 (communications satellite). The ESA, established on 31 May 1975, is a uniquely civil space agency engaged not only in space research but in its practical applications as well. Some of its programs are common to all member nations while participation in others is optional. The agency's total annual budget is in excess of 6 billion francs. [Text] [Paris AFP SCIENCES in French 31 Oct 85 p 52] 8041/9869

CSO: 3698/220

AUTOMOBILE INDUSTRY

DAIMLER-BENZ HAS DIVERSIFICATION STRATEGY FOR FUTURE

London THE ECONOMIST in English 25 Jan 86 pp 82-83

[Text] Daimler-Benz, maker of the Mercedes-Benz car, is most West Germans' favourite company. For good reason: its cars are the most obvious symbol for the status seeker in Frankfurt, Hollywood or Nairobi.

On January 29th, the company, which knows full well that history enhances reputations, celebrates its centenary—and arguably, that of the automobile itself. On that day one hundred years ago, Carl Benz patented the design of his three-wheeler motor car. It was the year, too, in which Gottlieb Daimler tested the first petrol-driven car on four wheels. Though they lived only 60 miles apart, the two men never met. The merger of their two firms in 1926 was something neither had planned.

Daimler has more than just a birthday to celebrate. Its profits after tax in the year to the end of December 1985 are likely to have hit a new peak of DM1.6 billion ($650m), on sales of DM51 billion, up 17% on 1984. If it continues to grow at the same rate, Daimler should next year become West Germany's biggest company by turnover—bigger even than Volkswagen or Siemens, the electronics group.

Last year was not only Daimler's best yet, it was also a watershed for the company. In the space of a few months, Daimler made three big acquisitions outside the motor industry.

First, in April, it bought the 50% it did not already own of MTU, a manufacturer of aircraft engines, from MAN, West Germany's ailing truck maker. Second, in June, it acquired a 65.5% stake in the Dornier aerospace group after a feud prompted the company's family owners to sell their controlling shareholding; third, and most important, in October it bought a big shareholding in AEG, the vacuum cleaner-to-satellite company.

Together, these deals are costing Daimler around DM2.6 billion. Yet, says the company, its 1985 balance sheet is likely to be little changed from 1984's—which showed DM6.3 billion in cash and cash equivalent. Against this, it had long-term borrowings in 1984 of less than DM1 billion.

The purchase of MTU, Dornier and the stake in AEG also makes Daimler West Germany's second-largest defence contractor. Daimler needed to buy them because:

- electronics offers a better chance of long-term growth than the motor industry. Moreover, electronics in one form or another is an increasingly important part of cars and of their manufacture. Household appliances made up only 15% of AEG's DM11 billion sales in 1984; the rest came from such things as turbines, robotics, and data processing. Daimler reckons it will pay to have this expertise in-house; hence the acquisition of the AEG shares.
- Daimler, Dornier, MTU and

AEG all spend heavily on research and development. Excluding AEG, which has yet to be consolidated, the companies' combined R&D spending is about DM3.5 billion a year, of which the bulk is Daimler's. It hopes that by linking up all three companies, its R&D costs will fall.

Buying the tax-losses

Daimler, which is 28%-owned by Deutsche Bank, is getting a bargain in AEG. Dragged down by losses in its consumer-durables subsidiaries, AEG sought court protection from its creditors in 1982. By cutting out the bits that were losing it money, Mr Heinz Dürr, AEG's managing director, has restored the company to reasonable health. On sales of DM11 billion in 1984, it made profits of DM100m, its first since 1980. Like Daimler, AEG is based in Swabia, the south-western corner of Germany near Daimler's home town Stuttgart. Furthermore, Mr Werner Breitschwerdt, the chairman of Daimler, and Mr Dürr are old friends.

Nevertheless, Daimler ruffled a few feathers when, last October, it bid DM170 a share for AEG. It had already bought 24.9% of AEG by taking up a big increase in AEG's share capital all by itself. In addition, it had an understanding with a number of banks enabling it to buy more shares to give it control. AEG's shares have since been changing hands for as much as DM260 on hopes that Daimler will bid for the rest of AEG.

Daimler needs 95% of AEG's shares if, under West German law, it is to take full advantage of the DM3 billion-or-so of tax losses that AEG has built up in the past few years. Assuming the West German cartel office approves the purchase of a controlling stake—which looks a formality—Daimler (if it wanted to) has three years in which to buy the remainder of the shares and use AEG's tax losses.

Daimler has a keen interest in those losses since it pays more tax than any other West German company, despite making the maximum amount of provisions in its accounts. In 1984, Daimler's total tax bill was DM2.1 billion, levied at an average tax rate of 56%.

Daimler is not alone in buying into hi-tech companies as a way of getting the expertise it needs, or of diversifying. Last year America's General Motors (GM) bought Electronic Data Systems for $2.5 billion, as well as Hughes Aircraft, an aerospace and defence contractor; Ford and Chrysler have also bought stakes in aerospace companies.

The difference between Daimler and GM, however, is that Daimler is much less vulnerable to swings in demand for cars. When, in the early 1980s, American motor manufacturers slid alarmingly into the red, Daimler drove onwards. This was only partly because Daimler's sales of luxury cars are less susceptible to swings in consumer spending. It also stems from Daimler's philosophy of gradual growth.

The company has long had a policy of making only as many cars as it reckons it can sell during a recession. The result is pent-up demand for its cars and long lags in delivery. To many carmakers, this would be a weakness; not, so far, for Daimler. In West Germany, 90% of Mercedes-Benz owners buy another one when they change cars; in many other countries, the figure is as high as 80%.

Daimler was among the few carmakers not to suffer at the beginning of 1985 when West German lawmakers dithered over changes in the law over the emission of exhaust fumes. For months Germans stopped buying cars for fear of purchasing one that would fall foul of the yet-to-be-decided law, and so deny them tax perks allowed for cleaner types of car. Daimler was able to shrug off the effect of falling sales partly because it produces diesel-powered cars (which throw out fewer fumes); partly also because most Mercedes-Benz drivers are rich enough not to worry about losing tax perks.

As a result, in the first 11 months of 1985, Daimler's car sales were up 17% (from 220,000 cars to 258,000), giving it 11.6% of all sales in West Germany—and at a time when the domestic market was shrinking by 1.2%, from 2.5m to 2.2m cars. During the same period, sales of Daimler's arch rival BMW fell 9% (from 148,000 to 135,000).

Daimler's ability to pick up sales in a falling market has al-

lowed it the luxury of not having to chase sales in America, its biggest market after West Germany. Its 500 dealers there called in vain last year for increased shipments, even though a strong dollar against the D-mark would have boosted the amount Daimler got for each extra car it sold.

Daimler decided not to step up shipments in part because sudden increases in the supply of new cars tend to lower the value of second-hand ones. If second-hand values fall, existing owners are less likely to sell their present model to buy a new one, so, in turn, hurting new-car sales. Daimler's reluctance to step up shipments to America has not prevented it from increasing its market share there. It sold 85,000 cars in the United States last year. Another 10,000 or so new-(ish) cars were sold in the grey market. These are cars imported without Daimler's authority and often illegally.

All told, exports accounted for half of Daimler's output last year. After America, its main markets were France, Britain and Italy. Coming up in the fast lane is Japan, where Daimler sold 7,000 cars last year, and where it is setting up a sales subsidiary. In Britain, Mercedes-Benz buffs can pay anything from around £11,000 for a 190 model to £37,000 for a plush saloon in the company's 500 series.

Despite its growing exports, Daimler still makes all its cars in West Germany and, so far, has no plans to set up plants abroad. One reason is that, in contrast to most volume carmakers, Daimler gets 90% of its parts and components from its own country.

In 1985, 540,000 Mercedes-Benz cars were produced, up from 350,000 in 1975. The increase is largely due to the launch in 1983 of its 190 model, the smallest version of the saloon range. In introducing the 190 Daimler took a gamble: would sales of the 190 be instead of, rather than in addition to, sales of other Mercedes models? So far, the answer is no. Production of the 190 hit a peak of 211,000 cars in 1985, compared with 90,000 the year it was launched.

The introduction of the 190 has done two main things for Daimler: first, it has attracted new customers, reducing the average age of a Mercedes-Benz owner from 45 to 40. Second, it has given Daimler's image a facelift. Always conservative, Mercedes-Benz cars were in danger, until the introduction of the 190, of becoming stodgy.

Keep on trucking

Although Daimler owes its reputation mainly to the quality of its cars, until recently its main money spinner was commercial vehicles. Daimler is the world's largest producer of heavy trucks (those over six tons in weight). In the past, commercial vehicles accounted for more than half Daimler's turnover. But, with the increase in its output of cars, this share has dropped back to around 40% of sales.

Daimler does not separate the income it gets from cars and commercial vehicles, so it is hard to judge how much of its 1984 profits came from trucks. At the moment, probably not much. Daimler did well out of the last oil-price boom in the late 1970s, when the Middle East became one of its biggest markets for commercial vehicles. Daimler has more than 70% of the Saudi Arabian market.

With business in the Middle East drying up, Daimler's output of trucks worldwide last year nevertheless remained stable at around 222,000. Some 30% of the company's trucks, unlike its cars, are made outside West Germany, most of them in Brazil. Daimler makes 25% of the commercial vehicles sold in Europe, and about half those in West Germany.

To get a tyre-grip in America, in 1981 Daimler bought Freightliner, a manufacturer of heavy trucks, for $260m. The timing could not have been worse. No sooner had Daimler completed the deal than trucks' sales were stalled by America's recession. Sales have since recovered, rising 68% in 1984 (from 82,000 to 138,000). Freightliner is collaborating with Daimler's truck-making offshoot in Brazil, which now exports trucks to America for assembly at the company's plant in Hampton, Virginia.

Daimler has proved that it can make money from making cars when most of its rivals, particularly the volume carmakers, are losing it. But, will it be as good a manufacturer of vacuum cleaners and defence equipment as it is of cars?

A big advantage is that Daimler has the backing of the state government of Baden-Würtemburg, of which Stuttgart is the capital. It was Mr Lothar Späth, state prime minister and leader of the ruling Christian Democrat party, who brought Dornier and Daimler together last year. Worried that the offer of generous tax breaks would persuade the aerospace company to move its factories (and the jobs that went with them) to Bavaria, he persuaded the founding family, and biggest shareholder, to accept Daimler's offer.

Daimler has since set up a new factory in Bremen to make its 190. But the bulk of its new 199,000 workforce still lives and works in Baden-Würtemburg. An enlarged Daimler, getting a big proportion of its profits from hi-tech and defence work, is just the sort of company Mr Späth wants to see in his state. Having helped build the bigger Daimler, he is unlikely to let it stumble.

It remains to be seen whether Mr Breitschwerdt, Daimler's chief executive, can hold together the company's management. This is a group better known for its attention to engineering detail than for its willingness to change, and Mr Breitschwerdt is himself an engineer. Last week Mr Breitschwerdt appointed Mr Peter Stehle, of the industrial group Diehl, to the board of AEG—the first outside appointment since Daimler took control.

Observers worry, too, whether Mr Breitschwerdt and Mr Dürr, his opposite number at AEG, will continue to see eye to eye. Optimists counter that both men were born and brought up in Stuttgart and, so far, share the same dream of building a conglomerate that will make all the hi-tech components with which cars are being fitted.

If GM can buy the skills it needs in EDS and Hughes Aircraft, why not Daimler? The company's detractors say it is not the direction Daimler is going in that worries them, merely the uncharacteristic speed at which it is travelling.

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CSO: 3698/271

BIOTECHNOLOGY

MAJOR AREAS FOR EUREKA RESEARCH PROPOSED

Paris BIOFUTUR in French Oct 85 pp 13-14, 17-18

[Article: "Projects for EUREKA"]

[Excerpts] In biotechnology, there is no lack of opportunities for European cooperation. According to information we obtained from the MRT [Ministry of Research and Technology], from CESTA [Study Center for Advanced Systems and Technologies], from ORGANBIO, from manufacturers, and from members of our editorial board, six projects appear to be close to approval. From among many potential projects, we mention a few that are certainly worth examining.

The Host-Vector Pair

Development of a host-vector pair based on a microorganism easy to cultivate and capable of bringing about the desired post-translational modifications would be of great economic importance.

It is significant that a French-German think tank, coordinated by G. Nomine for France and J. Collins for the FRG, has been developed within the framework of AFAST [French-German Association for Science and Technology]. French industrialists proposed four themes--1. Bac. subtilis, 2. yeasts, 3. animal cells, and 4. streptomyces and corynebacteria--to the Ministry of Foreign Trade and Industrial Redeployment and to the Ministry of Research and Technology, which passed them on to the German organizations.

New Vaccines

The development of biotechnologies has enabled design and subsequent production of new vaccines which are important for health and economic reasons.

It is therefore understandable that research has intensified enormously, that in addition to the established European manufacturers (Pasteur, Merieux, Wellcome, Behring, RIT [Therapeutic Research and Industries]) and the Americans (Merck, Lederle, Connaught, etc.) new competitors have appeared on the market (Mead Johnson, American Home Product, Smithkline-Beckman, Johnson & Johnson), and that the European genetic engineering

companies (Transgene, Biogen, AKZO [General Potassium and Sodium Company, the Netherlands] and the Americans (Genentech, Cetus, Amgen) have included vaccines in their research progrmms.

It is essential that research into new vaccines conducted by large European centers be coordinated and intensified within EUREKA because:
-Europe must protect its scientific achievements in this field where its research is of the highest quality;
-effective vaccines against major endemic tropical diseases will be Europe's best ambassadors in Third World countries;
-market potentials are significant;
-Europe cannot afford to be dependent in the fight against the new, threatening infectious diseases (AIDS, Legionnaires' disease).

Artificial Seeds

Many laboratories, active either in public research or in French and European industry, are mastering methods of in vitro plant cultures and gene transfer.

If it is acknowledged that the industrial production of artificial seeds will upset the seed market ($10 to $12 billion) in the coming 10 years, then reorganization and coordination of European research and development in this field will strengthen and amplify the European presence in this market, whose strategic nature is obvious.

Prospective European partners are:
-France: Clause, Biolafitte, Limagrain, Moet-Hennesy, Rhone-Poulenc, SANOFI,...
-Belgium: Plant Genetic Systems, SES [European Seed Company],...
-Denmark: De Danske Sukker Fabrikker [The Danish Sugar Factories],...
-The Netherlands: Royal Sluis,...
-Great Britain: AFRC, [Agricultural Genetics Company, Shell Nikkerson,...
-Switzerland: Ciba Geigy, Nestle,...

Tomorrow's Food

The objective of this project is to produce food that is better adapted to nutritional needs and consumer expectations (organoleptic requirements, incorporated service, etc.) by making use of new capabilities of biology and analysis.

The program consists of two aspects:
-better understanding of nutritional needs (according to life-style and types of activity) and the relation between nutrition and health;
-a better control of production processes beginning with agricultural raw materials. Because many of these production processes use fermentation by microorganisms, it is necessary to know more about the physiology of microorganisms (yeasts, bacteria, fungi, etc.) in order to automate transformation processes, to optimize the production of certain metabolites

which provide the desired nutritional or organoleptic properties, and to orient applications of genetic modifications of microorganisms.

Prospective partners are:
In France:
-Companies: BSN [Boussois-Souchon-Neuvesel], Pernod Ricard, SODIMA [dairy products company], Bel, ULN [Normandy Milk Corporation], Moet Hennessy, Jacquet, GB [General Biscuits], SANOFI [Aquitaine Financial Combine for the Hygienics and Health Sectors], Roussel Uclaf, associations of smaller companies into organizations amalgamated in ACTIA, and AFNOR [French A Association for Standardization].
-Public organizations: INSERM [National Institute for Health and Medical Research], INRA [National Institute for Agronomic Research], INSA [National Institute for Applied Sciences] Toulouse, universities.

In Europe:

The projects under consideration have already been the subject of favorable discussions with official representatives of Great Britain, the FRG, Italy, and other EEC countries, with the EEC acting as an intermediary.

Control and Regulation Systems

Research and development programs concerning problems of control and precise regulation may be used for the control of bioreactors and for the micro-administration of medicines or therapeutic products via equipment implanted in the human body.

Along with the need in the bioindustrial sector to control multiple parameters of reactions (behavior of fermenters) requiring sophisticated sensors and control systems, recent progress in the fields of miniaturization of control electronics and understanding of ultra-fine biological parameters (hormonal dosages) is leading to calls for establishment of an interdisciplinary project which would unite specialists in electronics and in the devices controlled (and miniaturized through biomedical engineering) with specialists in pharmaceutics, pharmacology, and clinical medicine.

Repercussions:
-New control systems for biological reactors which permanently optimize the bioreactive medium in order to obtain a continuously higher output.
-New administration systems for medicines which are regulated in accordance with biological parameters (e.g., implanted insulin pump).

Partners:
-France: Elf-Aquitaine and numerous French companies in the sensors field.
-FRG: Siemens, etc.

Enzymes for Bioconversions

The development of biotechnologies in the chemical industry is especially dependent upon future progress in bioconversions, i.e., the use of

enzymes, isolated or not, for catalytic transformation of one specific substance into another.

In addition to the increased activity of the enzymes in their natural environment, the anticipated progress is linked to the possibility of using these enzymes under different reactive conditions: pH, temperature, organic solvent, pressure. By way of example, we can mention a peptidase capable of functioning as synthetase when it reacts an organ solvent.

Isolated enzymes of thermophilic microorganisms are good models for those enzymes which are adaptable to "extreme conditions." Therefore it is necessary to encourage:
-study of thermophilic microorganisms (isolation, enzymatic spectrum);
-research into characteristics likely to explain the stability of enzymes obtained from thermophilic microorganisms;
-development of methods capable of stabilizing enzymes by structural, genetic, or chemical modification;
-optimization of enzymatic reactions reversing their natural equilibrium
-in general, all research apt to enlarge the field of activity of enzymes and to discover new enzymatic activities.

Isolation Methods Suited to the Discovery of New Secondary Metabolites

Unlike its Japanese competitors, Europe has neglected for several years an important potential source of new fermentation products for the pharmaceutical, phytopharmaceutical and agro-food industries, Discovery of these products requires mastering specific isolation methods. It would therefore be quite useful to encourage research and development of new isolation tests suited to the discovery of active secondary metabolites in the pharmaceutical, phytonsanitary and agro-food sectors.

Monoclonal Antibodies Suited to Therapeutics

Compared to the large-scale development of diagnostic applications of monoclonal antibodies, development of their therapeutic applications for continuous treatment has been restrained by several difficulties, such as the industrial preparation of non-immunogenic monoclonal antibodies free of suspect particles.

Research is now being carried out in different fields (univalent monoclonal antibodies, chimeric monoclonal antibodies, etc.), but the problem remains unresolved. It is advisable to include research projects intended to supply industry with the bases of satisfactory methodology for mass production of monoclonal antibodies which can be used for continuous treatment.

Actinomycetes and Antibiotics

Antiboitics are among the most economical products in the therapeutic arsenal. Their importance justifies both a constant search for new products and improvements in the manufacturing of traditional ones.

A large number of antibiotics are produced by actinomycetes. A better understanding of these microorganisms and the biosynthetic stages of their products would permit improvement of production by working either on the genes involved or on the control mechanisms. Such advanced understanding would also enable discovery of new antibiotics via the modification of genes which act as encoders for the enzymes involved or by addition of analogous biosynthetic intermediaries.

Thus, for the sake of the economic development of the European pharmaceutical industry, it seems important to encourage research into actinomycetes (physiology and genetics, development of efficient vectors) and into the enzymatic biosynthetic stages of the antibiotics produced.

Availability of New Essential Amino Acids for Animal Feeds

The importance of supplementing European cereals with essential amino acids to produce feeds without soya imports has been widely recognized.

Methionine and lysine are available, and several laboratories are studying economical industrial production of tryptophan and threonine. It is probable that if these four amino-acids are used, other essential amino acids will probably become inhibitors. In order to prepare for this situation, it is necessary to initiate, starting now, studies simulating the situation a few years hence in the nitrition of various single stomach animal species in order to determine the amino acids needed then and acceptable prices.

On the basis of these results, it will probably be necessary to initiate research in the field of bioconversions in order to supply the chemical industry with the necessary foundations for economic production of the amino acids selected.

This plan should have a positive effect on Europe's trade balance and, at the same time, on agriculture and on the chemical industry, which will have been able to start research ahead of competitors outside the EEC.

Wheat Starch

Within the context of the European wheat surplus, it would be expedient to support research projects aimed at improving the profitability of production of wheat starch, a raw material of great importance to bioindustry.

In the current state of technology, this profitability seems principally linked to the exploitation of by-products, which falls into two categories:

-Isolation of wheat starch: In cases where wheat starch is isolated and used as such, it would be appropriate to study how wheat gluten could be utilized in the human diet. Indeed, if production of wheat starch were to increase considerably, current wheat gluten markets would soon be saturated.

On the other hand, it would be important to support research projects aimed at obtaining wheat varieties suited to the starch industry.

-Utilization of wheat glucides as a raw material for fermentation (e.g., alcoholic fermentation): In this case, it would be appropriate to study the exploitation of the by-products of alcoholic fermentation in animal feed.

Framing the Argo-Food Bioindustry

The agro-food industries are part of Europe's wealth. Modern biotechnological concepts make significant improvement possible in these industries' traditional procedures.

However, the biological systems used are particularly complicated: complex and variable substrates, polyenzymatic transformations, the population of microorganisms. Before significant progress can be made, this complexity requires preliminary research aimed at analyzing the different elements involved and their interactions.

Such projects, clearly formulated and concerned with specific agro-food transformations, are worth encouraging.

It is equally necessary to encourage study of the physiology and genetics of microorganisms used by these industries, especially lactic ferments.

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BIOTECHNOLOGY

NETHERLANDS PROMOTES BIOTECH RESEARCH

Paris AFP SCIENCES in French 31 Oct 85 pp 21-22

[Article: "Netherlands: a Biotechnology Paradise?"]

[Text] Will the Netherlands become the delta of European biotechnology? This question, recently asked at a Dutch symposium by a corporate executive, is indicative of the importance attached to biotechnology in the Netherlands. For several years now, one of that small country's priority goals has been to gain a position among the leaders in the biotechnology market. With strong government backing, the academic community and manufacturers are building a scientific complex, based on a "Biotechnology Delta" concept, in the Leiden and Delft region of South Holland.

With the formation of the Biotechnology Program Committee (PCB) in 1981, the innovation-oriented biotechnology research program really got underway. Its objective is to encourage advanced research capable of industrial application within 5 to 10 years.

The committee's membership includes an equal number of manufacturers and scientists. It is chaired by Professor R.A. Schilperoort who back in 1982 was advocating quick action conducive to the Netherlands' takeoff in this field.

"The Netherlands has two strong points in its favor", he explained. "It has a good level of expertise in the basic techniques required for biotechnology research and applications. Furthermore, the Netherlands has the advantage of being a small country, thereby facilitating contacts between researchers and the exchange of information. In addition, the Necherlands has several large companies that are very active in the biotechnology field and possess the financial capacity, the experience, and the sales know-how biotechnology needs."

But Professor Schilperoort also acknowledges his country's shortcomings: "a gap between scientific research and the needs of the market,... a lack of specific cooperation between industrial firms and research institutes,... defeatism and the lack of enterprising spirit."

The largest concentration of research and production potential lies in the province of South Holland between the cities of Leiden and Delft. "Leiden's scientific pool engaged in life sciences work," the professor continued, "is composed of university laboratories, Dutch and American firms. It seems capable of providing fertile ground for new biotechnology activities launched on a small scale. This is one of the key points in the Netherlands' ambitious concept of a delta of European biotechnology.

The government has already allocated nearly 16 million guilders (about 53 million francs) to the biotechnology program. The number of biotechnology researchers in some 100 laboratories has grown from 1,600 in 1981 to 2,000 in 1985.

For the 1985-1988 period, 70 million guilders (approximately 230 million francs) have been allotted to the overall program, and about 25 million guilders will be allocated to each of the four subprograms: industrial application, agriculture, environment, and health.

One of the factors favorable to biotechnology, and noted by foreign observers, is the important role which tradition plays in the Netherlands. In a country where industrial applications of biotechnology have a long history--fermentation of beer, yeasts, cheeses, etc.--firms in those sectors have generally applied themselves to developing and employing new techniques.

The Gist Brocades pharmaceutical company, one of the leading Dutch manufacturers engaged in biotechnology, thus came by these techniques quite naturally through its experience with baker's yeasts. With more than 6,000 employees, this company has expanded its traditional knowledge of large-scale production of biologicals. In 1984, for example, it spent 80 million guilders on research.

According to one of the company's executives, Peter Mars, it is currently making penicillin and enzymes by biotechnology processes and has developed a biologic water-softening device generating methane.

Strengthened by these successes based on a traditional industry, Netherlanders are now centering their effort on innovation and productivity. As explained by Henry Shoemaker of the Centocor company, "some studies suggest that small companies produce 24 times more innovation per dollar invested than large companies."

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BIOTECHNOLOGY

FRENCH FUND FOR BIOTECH USES IN FOOD PRODUCTION

Paris AFP SCIENCES in French 31 Oct 85 pp 17, 19

[Excerpts] Paris--Over the next 3 years, the government is going to devote 540 million francs to research and food production processes for the year 2000. This was announced on 25 October by the ministers of agriculture and of research and technology, Henri Nallet and Hubert Curien.

The state is going to help the food processing industry develop research programs. As early as 1986, the combined credits provided by the Ministry of Agriculture and the Ministry of Research for this type of operation will be doubled to 180 million francs as part of a multiannual program (1986-1988) included in the development act.

That effort is intended to amplify the effort by certain firms and the research institutes (particularly the INRA [National Institute of Agronomic Research]). The research will be conducted in consultation with manufacturers in the food processing industry, who are being invited to submit their projects to the ministries concerned in order to receive technical and financial assistance. The government has appointed two civil servants--Louis Lucas of the Ministry of Agriculture and Jean Guerin of the Ministry of Research--to be in charge of studying the projects submitted by the firms.

The purpose of the government program is to accelerate research in the fields of food engineering and biotechnology in the broad sense. It calls for the establishment or strengthening of research laboratories, the setting up of scientific teams specializing in nutrition and food technology, and the startup of studies concerned with food quality and manufacturing processes.

Priority Multiannual Program for Technological Research and Development in the Agricultural and Food Industries "Food 2000"

Financial Data

The priority technological research and development program is to mobilize the resources of two ministries. The effort planned for 1986 is as follows:

	Millions of francs	
Ministry of Research and Technology:		
Research funds: biotechnology mobilization program	35	Incentive actions
IAA [Agricultural and Food Industries]	55	
Subtotal	90	
Ministry of Agriculture:		
Strategic Intervention Fund (FIS)	25	45 million francs
Agricultural Development Bonus (POA)		
IAA research and development	23	
Increased training funds for IAA (plus 2 million francs from the Ministry of National Education)	22	
Subtotal	90	
Grand total	180	

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CIVIL AVIATION

FRG'S 'ATTAS' CALLED MOST MODERN IN-FLIGHT SIMULATOR AIRCRAFT

Duesseldorf VDI NACHRICHTEN in German 25 Oct 85 p 22

[Article by JOR: "Attas Flving Research Lab: In-Flight Simulator Aircraft Called Unique in Europe, DFVLR Takes over Testbed for the Aircraft Technology of the Future"]

[Excerpts] Since 24 Oct the DFVLR has access to the Attas, a research aircraft for civil flight which is unique in Europe. Attas, the name of the in-flight simulator aircraft developed by Messerschmitt-Buelkow-Blohm (MBB), is an acronym for Advanced Technologies Testing System. The rebuilt Model VFW 614 jet aircraft is supposed to serve as a testbed for the aircraft technology of the future. The research aircraft is stationed in Braunschweig at the Institute for Flight Mechanics of the German Research and Testing Laboratory for Aeronautics and Astronautics.

After a standard aircraft was chosen as a base, it was retrofit for the Attas in close cooperation between MBB and the DFVLR. The entire cabin facilities were expanded, the control system for the elevators, rudders, landing flaps and the power plant were dismantled and the instruments were also removed from the cockpit.

What was left was the basic structure of the aircraft, which was re-equipped. An electronic-hydraulic control system (fly-by-wire) was installed. For safety reasons this digital-electronic control system had to be augmented with a conventional back-up cable control system.

The flap system was also upgraded to allow for rapid wing lift control over the entire flying range and to provided improved flying comfort and structural loading during gusts.

The cockpit can't be compared to a production aircraft anymore. The two-man cockpit in the VFW 614 has been divided up to create a work station for the test pilot on the left side and one for the safety pilot on the right side. The test pilot can use engagement and shift equipment in the cockpit and other points in the control system to control Attas electronically and automatically via a data processing system. The necessary instrumentation for conducting the testing program is installed on the left, i.e. the test pilot's, side of the cockpit.

If problems occur during test flights, the safety pilot in the right-hand seat can take over control of the aircraft using the conventional systems, thus eliminating any safety risk.

The cabin of the research aircraft, which was originally designed for 40 passengers, has now been equipped with eight instrument racks to accommodate the extensive array of testing equipment. This includes five high-performance, state-of-the-art computers, a programmable measuring instrument and the digital control electronics for the fly-by-wire control system. The equipment also includes a PCM-telemetry unit which sends measured data to the ground station already during the test flight via high-frequency transmission. The rebuilt cabin features four work stations for research and testing engineers.

Once Attas is in full operation in spring of 1986, the it's first assignments with the Braunschweig flight test group of the DFVLR will involve the following :

- moderating the unpredictable effects of gusts and turbulence on aircraft in the interest of increasing passenger comfort and possibly decreasing material fatigue.

- improving the safety and performance capability of the aircraft piloting system through the introduction of a computer-controlled safety system.

- simulation of the flying characteristics of new aircraft which are still in the draft stage.

- harmonization of the flight control and flight safety systems using digital computers and an air-to-ground fail-safe data link. This will make it possible to cut down on maintenance cycle time during landings.

- cooperation between human and artificial intelligence in the aircraft. The use of electronics is constantly changing the pilot's tasks. Workstations which are adapted to new pilot tasks (cockpits) can be used with Attas even before they are introduced into new production aircraft.

Using computer technology, Attas can be expanded and retrofit to accommodate as yet unforeseen engineering tests.

The Attas flying research lab, which cost 40 million DM to retrofit, counts as one of the most modern in-flight simulator aircraft in the world. A small jet aircraft from the 70's has been transformed into a state-of-the-art testbed for the aeronautical engineering of the future.

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CIVIL AVIATION

AUSTRALIA ORDERS AIRBUS WITHOUT SNECMA-GE ENGINES

Paris LA TRIBUNE DE L'ECONOMIE in French 21 Dec 85 p 16

[Article by Ar. R.]

[Text] Following in the footsteps of Ansett, Trans Australia Airlines [TAA] is planning to buy nine Airbus A 320's--a contract valued at around $420 million--bringing to 26 the number of planes of this type now ordered by Australia. But the two companies have not chosen the same engine.

It is a hard blow for SNECMA. TAA has decided to equip the nine Airbus A 320's it plans to order with V 2500 engines. It has even delayed the delivery date of these planes so that it can safely count on the engine being offered by the group comprised of Pratt & Whitney, Rolls Royce, MTU, and three Japanese companies.

The Australian company is to receive the first of its A 320's in April 1989, six others in September of the same year, and the remaining two in June 1990.

It is unquestionably a poke at SNECMA which, jointly with General Electric [GE], are proposing the CFM-56-5 to power the small Airbus 150-seater. The Franco-American group fully expected to land the Trans Australia Airlines order, if for no other reason than because its engine had already been selected by the company's principal competitor, Ansett Airlines, to power the 17 A 320's (8 firm orders, 9 options) it ordered in May.

For Airbus, these two contracts have a symbolic value. They mark the European consortium's penetration of a sector of the world market in which competition with the Americans is particularly severe. Thus, SNECMA and GE could also hope to score a repeat performance. That hope has been shattered. And the blow is all the more serious for the two engine builders given the significance of the TAA approach.

It demonstrates that some airline companies, needing as they do to renew their fleets, can still afford to wait several additional months simply because of the engine. This is precisely the assumption on which Pratt & Whitney and Rolls Royce have banked. They are offering a new engine for a new plane, whereas SNECMA and GE are offering a derivative of a tested and proven production run.

Initially, The latter group thought this would be sufficient to wrap up the market. Today, they are having to recognize that a technological advance, even if it entails not only an additional expense but also an additional risk, is a powerful selling argument.

Whereas hardly anyone believed in the V 2500 project when it was launched, 339 of these engines have been ordered to date.

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CIVIL AVIATION

BRIEFS

A-320'S FOR LUFTHANSA--Franz Josef Strauss, the director of the board of trustees of Deutsche Airbus GmbH, announced a final purchase and options contract for 50 Airbuses with the German national airline Lufthansa. This was announced on Wednesday (18 Sep 85) outside the colloquy of the West European Union (WEU). The contract, worth approximately DM 6 billion, is supposed to be signed on Friday (20 Sep 85). It covers the purchase of 15 Airbus A-320's and seven A-300-600's, and the option for an additional 25 A-320's and three A-300-600's, including spare parts. [Text] [Duesseldorf HANDELSBLATT in German 19 Sep 85 p 11] 13071

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COMPUTERS

BULL OF FRANCE EXPANDS LINE OF SCIENTIFIC COMPUTERS

Paris ZERO UN INFORMATIQUE HEBDO in French 12 Nov 85 p 9

[Article by Guy Hervier]

[Text] By adding five new models to its SPS9 systems, stemming from Ridge Computer, Bull expects to gain a significant position on the growing market of scientific and technical applications.

One year after the announcement of two systems, the SPS9/40 and 9/60 models, Bull is strengthening its offer in the scientific and industrial fields.

The SPS9 line now includes seven models, among which a low end work station. The models are build around two types of central processors: a standard one, which delivers a performance comparable to the VAX 11/780, and the other, a high performance processor, equivalent to the VAX 11/785.

More specifically, the first has a processing speed of 1.5 Mega Whestone in single precision and 0.5 Mega Whestone in double precision. The corresponding figures for the second are 1.8 and 1 Mega Whestone.

The SPS9 architecture is organized around two buses: the first, connecting the central processor to the memory, and operating at 10.7Mb per second; and the second, intended for input/output, whose speed is 8 Mb per second. Manipulating 32-bit addresses and data, the standard, RISC-architecture central processor, operates on a cycle of 125 nanoseconds.

The RISC architecture of the SPS9 line is characterized primarily by a small number of instructions and a large number of registers, it being possible to play with these two features. With only 32 registers, the SPS9 has stressed the second aspect, with 88 instructions.

The processor includes two independent functional units: the execution unit, which contains the registers (16 general and 16 non-specialized), the arithmetic unit, and the instruction loading unit. The latter includes a 256 Kb cache memory. As most machines with this performance, the processor includes a four-level pipeline system for instruction recovery.

The six SPS9 models

	9/40 (*)	9/45	9/60 (*)	9/62	9/65	9/67
Présentation (A)	servante (J)	servante (J)	armoire basse (K)	armoire basse	armoire basse	armoire basse
Unité centrale (B)	standard	haute performance (L)	standard	standard	haute performance	haute performance
Mémoire (min-max) (D)	4 à 8	4 à 8	4 à 8	4 à 8	4 à 8	4 à 8
Capacité sur disque dur (Mo) (E)	78	78	142	445	142	445
Unité à disquette (F)	1	1	1	1	1	1
Voies asynchrones (min.-max.) (G)	4 à 8	4 à 8	4 à 12	4 à 12	4 à 12	4 à 12
Nombre d'écrans graphiques Bit Map (H)	2	2	4	4	4	4
Extensions disques et bandes possibles (I)	oui (M)	oui	oui	oui	oui	oui

Key: (A) Presentation
(B) Central processor
(D) Memory (min-max)
(E) Hard disk capacity (Mb)
(F) Floppy disk unit
(G) Asynchronous lines (min-max)
(H) Number of graphic bit map screens
(I) Possible disk extensions and tapes
(J) Rack
(K) Low cabinet
(L) High performance
(M) Yes

(*) Former models in the line

In turn, the system has a 4 Mb memory expandable to 8 Mb, and a cycle of 375 nanoseconds.

Depending on models, the system accepts 78, 148, or 445 Mb disk units in the main chassis; up to four more units can be added in expansion boxes. The SPS9's can support two graphics stations (9/40 and 9/45) or four stations (9/60 to 9/67), as well as a minimum of four asynchronous lines.

The SPS9's can be interconnected through an Ethernet local network. A Hyper-Channel coupling connector allows an SPS9 to be used as the work station of a very powerful system, such as a Cray.

The SPS9's use the RDS operating system, which combines the AT_T version of System V and the Berkeley version of BSD 4.2. The latter manages the hierarchic files of the virtual memory, and includes the C Shell control language.

It contains line-mode or page-mode editors, the Mainsail programming tools, and supports the programming languages C, FORTRAN 77, and PASCAL. The new ROS (3.3) version announced by Bull includes new functions for file transfer, remote job control, and electronic mail. It also provides optimized RISC compilers for the C and PASCAL languages, and an LE-LISP environment.

Waiting for Quicksilver

Together with this line of six systems, Bull also intends to be present in a market slot that is in full bloom, and which has made the success of Apollo or Sun, the autonomous work station designed for the engineer; IBM is expected to enter this slot very soon with a product called Quicksilver.

As the entry point of the of the SPS9 family, the model 9/30 is a station whose standard version consists of a 19-inch (1000 x 800 points) monochrome graphic screen, a keyboard and a mouse, a central processor with a 4 Mb memory (expandable to 8 Mb), a 78 Mb disk, two asynchronous communication lines, and an integrated Ethernet coupler.

For the SPS7 with an original multiprocessor (one to eight 68010's) architecture, the current announcements concern mainly the software. It is endowed with a data base organized around UNIX, a Spart Multiprocessor real time monitor, standard industrial interfaces (VME, Multibus, DR 11W, and IEEE 488), and standardized communications tools. The version containing Motorola's true 32-bit processor, the 68020, is planned for the second quarter of next year.

The improvements proposed by Bull for the SPS5 line (Sems' ex-Solar) are essentially concerned with peripherals, such as a new 50 Mb Winchester disk with the possibility of expansion to 150 Mb, a renewed line of printers (60 to 400 cps matrix and 650 lps line), and a 1600 bpi tape drive of the start/stop or continuous type.

Collaboration with SSII

In communications, Bull has made several announcements, notably for a local network of programmable automatic machines, a rapid parallel coupler (DR 11W) for connection to the SPS7's and SPS9's, and an asynchronous link to the SPS7's. Bull fully intends to eventually integrate its line of industrial products into the MAP network.

"While there is no real continuity between the SPS5 on one hand, and the SPS7/SPS9 on the other," explains Georges Grunberg, director general of Bull-Sems, these three machines have one point in common, and that is the market.

The evolution of the SPS5, which we should remember was announced ten years ago, is obviously limited. But for most industrial applications its updating is not really necessary. For new applications, users can henceforth turn to higher performance equipment, such as the SPS7."

Will the 10 percent share of the scientific and technical market be achieved by the national manufacturer? In the context of a lively competition, in which IBM could enter very soon, the answer is still premature. For the time being, Bull has supplied 120 SPS9's, 350 SPS7's, and more than 8000 SPS5's.

In terms of revenue, the largest portion (60 percent) of Bull-Sems' business comes from the latter. But beginning in 1986, the sales of SPS7's and SPS9's should exceed more than one-half of its revenues. In this field as in any other, Bull expects a solid contribution from SSII's [expansion unknown]. That was in fact the purpose of the Infosys SPS show organized last week in Paris with about 20 computer engineering companies. At present, the software library for SPS7's and SPS9's has about 60 programs.

The entire SPS9 line is now manufactured by Bull-Sems at the Echirolles plant near Grenoble. According to Bull, this French fabrication under Ridge license has led to a price drop of about 30 percent.

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COMPUTERS

BRIEFS

FRENCH-BRITISH SUPERCOMPUTER--French and British industrialists and researchers are planning to develop jointly, within 3 years, a supercomputer (capable of performing 500 million operations per second) under the European ESPRIT program. "The objective is to develop a powerful and decentralized data processing system, baptized Supernode, based on its interconnected and nodal character," the general manager of APSIS, Mr Jean-Francois Feldman, confirmed Thursday at Meylan (Isere), a French company employing 77 persons and associated with the project. The operation has been budget at around Fr 70 million, half of which is to be provided by ESPRIT. The European decision to proceed is to be announced within the next few days, according to Mr Feldman. The French and British teams consist of Royal Signals and Radar Establishment [RSRE], plus Thorn-EMI, and the University of Southampton, on the itish side, and of Telimat SA and Data Processing Engineering Laboratory of the University of Grenoble on the French side. Besides the traditional data management and computation applications, the contemplated domains range from image synthesis, and from computer-aided design and computer-aided manufacturing, to the processing of signals and images. These are all applications requiring that a Supernode network be able to be, in each case, custom-designed and built from interconnected basic components, according to Mr Feldman. [Text] [Paris LA TRIBUNE DE L'ECONOMIE in French 27 Dec 85 p 16] 9399

FRENCH COMPUTERS TO SOVIETS--Steve Jobs, the creator of Apple, was in Moscow last July. IBM and the others have also submitted their service offers. Some 50 French industrialists and government representatives have been in Moscow since Monday negotiating for the sale of 150,000 microcomputers to the USSR, designed to equip its schools for data processing, a market valued at over Fr 1 billion. The USSR wants to implement its "data processing for all" plan, and the French companies Bull, Thomson and Lenord--the suppliers of the Fabius plan--feel they have a know-how to sell in this field. This week's symposium was organized to enable the French to present their proposals for a project--among others--to equip 10,000 schools. Negotiations also involve the creation of a Soviet software industry and the training of teachers. This meeting, called for the purpose of submitting proposals, was not expected to result in the signing of any contracts at its conclusion. But be that as it may, to land the orders, the French will have some tough competitors to deal with and will have to go hammer and tongs at the Japanese firms, which are also seeking to make a triumphant entry into this market, opened up by COCOM a year ago when it lifted its ban on the export of microcomputers. [Text] [Paris LA TRIBUNE DE L'ECONOMIE in French 20 Dec 85 p 20] 9399

CSO: 3698/231

FACTORY AUTOMATION

FRENCH, GERMAN INITIATIVES IN MOBILE ROBOTS

Paris L'USINE NOUVELLE in French 24 Oct 85 Supplement pp 96-98

[Article by Michel Defaux: "Mobile Robots: The Age of Emancipation"]

[Text] Whether supplying several machine tools, performing arc welding operations, machining very large parts, or even cleaning factory floors, autonomous mobile robots will soon travel up and down workshop aisles.

For several months now, manufacturers of robots and trolleys, in collaboration with research laboratories, have been trying to develop autonomous robots. The first creations, although still "rustic," are already in existence.

An approach has been tried with robots moving several meters mounted on trolleys, on rails, or on guides. This is what specialists call the seventh axis. This arrangement is used by Potain in Charlieu for arc welding of revolving-crane legs. The installation consists of a robot traveling in translatory motion over a distance of 7 meters and of two positioning systems. For the past 2 years, the manufacturers of the AOIP [Association of Workers in the Precision Instruments Industry] Kremlin painting robots have had a robot on the market which moves along guides to paint large parts or to do continuous work on assembly lines (the robot's speed is automatically controlled by the conveyor). To give another example, Jungheinrich has recently installed a robot at Siemens which travels over 15 meters in translatory motion between two rows of pigeonholes to fill orders for electronic components.

Today, however, distances remain short, and the underfloor infrastructure is very complex. Thus, manufacturers originated the idea of putting robots on board automatic floor guided trolleys, the so-called wire-guided units. Such an installation consists of one of those trolleys, now very well known in industry, an industrial robot with five or six axes, a platform which receives the parts or tools to be handled. A control system, and the electrical supply for the vehicle and robot, as well as positioning devices.

The Institute for Production and Automation (IPA) in Stuttgart has been working for some years on a similar project in collaboration with

the trolley and robot manufacturer Jungheinrich. A prototype was presented during the 1984 biennial machine tool show in Paris. A potential application gave rise to this study: Supplying machine tools with long operation cycles, resulting in underutilization of the loading robot. According to IPA officials, such a machine was able to fetch a pallet of unfinished parts, carry it to its position next to a numerically controlled lathe and replenish the part and tool bins. As soon as this operation was completed, the robot, with a 5-kg capacity, was able to service another machine. This is a tempting solution which avoids the use of a robot next to each machine tool. Nevertheless, it hardly convinced the machine manufacturers, not one real application of this equipment has been reported, and the machine remains a laboratory tool.

At the latest Hannover fair, the University of Duisburg in the FRG presented a high-capacity robot (up to 30 kg) which is still an extrapolation of the IPA model.

It will probably be the semiconductor industry, however, which will see the first applications. Work constraints in clean rooms are going to bannish operators, and to replace them, big companies such as IBM, Hewlett-Packard and Digital are considering the use of mobile robots. During Robots 9 in Detroit last June, Unimation and Veeco, on one hand, and Intelledex and FMS [not further identified], on the other, presented two prototypes of clean-room robots on board mobile platforms. Production is scheduled to begin in 1986, for not all technical problems have yet been solved, including those related to the electrical supply. The wire-guided trolley transports its own energy in the form of batteries, but it cannot supply the robot at the same time. Therefore, an energy supply must be provided at a specific place on the machine.

Towards Energy Supply and Data Processing Autonomy

More complex is the problem of a mobile robot placed on a rolling platform, explains J. R. Benner, technical manager of the French Conveyor Company (CFC), which is working on the subject. "We come up against varying accelerations caused by the robot's moving arm, which affects the positioning of the trolley. With the stopping precision of a self-propelled vehicle being about 5 mm, auxiliary systems have to be provided to position and center the robot." Thus, the Demag company, in cooperation with the technological University of Munich, proposed the idea of a conventional robot (the Mantech R-3 model) mounted on a base with the same form as a standard European warehouse pallet. In this manner the robot is transported from one machine-loading zone to another along with the pallets of parts. Electrical connections are provided at the work station. This way, the problem of equipment in motion on a mobile unit is avoided.

After these first steps in the laboratory, the mobile robots of tomorrow's factories will continue to evolve: Research mainly targets giving robots real-time perception of their environment, a means of determining their position, and navigation strategies allowing them to be free of underfloor

wires. At the same time, this research assumes that mobile robots will soon be autonomous in energy supply and data processing. For industrial trolleys using electrical batteries, as in so many other sectors, it is necessary to wait for accumulators with higher specific power and lower weight.

As far as the robot's "brain" is concerned, it will also have to be on board. The data processing structure will have a very hierarchical structure, and efficient components will be used (speed, size, memory, calculation capacities). When complete autonomy cannot be achieved, it will be possible to have an on-board unit connected by radio to a central computer. This is a preoccupation shared by numerous researchers: "Rapid progress in miniaturization and in microprocessor capacities leads us to believe that complete autonomy will soon be possible," H. Place of the INSA [National Institute for Applied Sciences] at Rennes reminded us during a 1-day conference on self-propelling robots.

Reading and Interpreting Data

The processing capacity provided by the on-board information system will greatly influence the robot's perception of the environment. For it is necessary to be able to read and interpret data coming from the sensors (camera, sonar, etc.). Among the techniques used by laboratories to understand a 3-dimensional environment are stereoscopic vision, monocular vision (the study of perspectives or projected shadows) and telemetry (laser, ultrasonics).

The same constraints are found in the localization of the mobile robot. Highly advanced research promises the appearance within 2 to 3 years of a new generation of self-propelling trolleys capable of following predetermined routes without a guiding wire installed in the floor. The techniques being considered are based on odometry, a method of relative location based on calculating the robot's instantaneous position using the distance traveled by its wheels, or on absolute position finding based on triangulation using equipment such as lasers and cameras.

However, these techniques once again assume considerable capacity on the level of the on-board microprocessors. Thus, General Electric Company in Great Britain utilizes a rotating low-powered laser, which strikes reflective bar codes placed within a 2 to 10 meter radius. The mobile robot thus calculates its own position by triangulation from data received from the bar codes.

Closer to home, the CERT-ONERA [Toulouse Study and Research Center-National Institute for Space Studies and Research] in Toulouse works on the same subject with the French trolley manufacturer CFC. The approach, however, is different; there would be no mobile parts on the trolley (conceivably vision system), but passive marks would be likewise used. Preliminary testing in progress.

Navigation strategies remain to be defined. Either the robot knows its environment perfectly or partially (as in the machining workshops), or

it navigates in a completely unknown environment (as with some intervention and military robots). In an industrial environment, the robot will follow a trajectory preprogrammed through training and avoid obstacles. This method was developed by Midi Robots within the framework of the RAM (Autonomous Multiservice Robots) program, in order to develop an industrial cleaning robot for all types of sites. The mock-up of this industrial tool has just been finished for the RATP [Autonomous Authority for Paris Transport]. By the spring of 1986, five to ten cleaning service companies will benefit from a preliminary series for the first tests. This robot is designed to clean smooth floors in geometrically simple rooms, large corridors, or uncluttered rooms. During the training period, an operator drives the robot and teaches it the straight lines and rotations necessary to accomplish the cleaning task. During execution, the robot reproduces the preprogrammed route going around obstacles (ultrasonic sensors).

Cartographic Robots: The Last Stage

This company [Midi Robots] is developing another kind of equipment which has also found a market: It consists of a service robot to supply a flexible electronics workshop with spare parts. The device will also be autonomous for energy and decision making (going around obstacles, letting other trolleys pass). The position finding elements used will be optical encoders on the wheels and ultrasonic sensors belting the robot 30 cm from the floor.

The final stage proposed by Midi Robots is that of "cartographic" robots with a layout generator running on a central computer. In this approach, the mobile robot placed in a workshop would draw up a topographical map of the premises by itself. Its sensors would be more sophisticated (video camera, laser telemetry) and its memory capacity more extensive. Once this work is done, the robot would transmit its data to the central operator. The central operator would create and control the varied tasks of robots. Each of the mobile robots would be given an itinerary in the form of successive stages.

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FACTORY AUTOMATION

BRIEFS

NEW ASEA ROBOTICS FACTORY--The Swedish foreign trade minister, Mats Hellstrom, has inaugurated a new plant of the Asea Robotics Division, the largest robot plant in Western Europe. The Swedish group Asea, which among other things manufactures hydroelectric and nuclear power plants, had revenues of 37 million francs last year; it employs 60,000 people. According to Bjorn Weichbrodt, director of Asea Robotics, the sales of Asea robots has grown by 50 percent during each of the past three years, while the world market of industrial robots has expanded on the order of 25 percent annually. The company's 1985 revenues will be about about 1 billion francs with 1500 employees in Spain, France, Norway, Japan, the United States, and of course, Sweden. The new Robotics plant will be located in the town of Vasteras, about 100 kilometers west of Stockholm. It will manufacture various types of robots, but all of them will be controlled by microcomputer systems. The potential of the new plant is of the order of 1100 to 1250 robots per year, but it should double subsequently. Most of the robots will be intended for the automobile industry, for painting and welding. In addition to finished robots, the Robotics plant, acting as subcontractor, supplies many sub-assemblies to other Asea plants throughout the world. [Text] [Paris ZERO UN INFORMATIQUE HEBDO in French 4 Nov 85 p 43] 11,023

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METALLURGICAL INDUSTRIES

FRANCE'S USINOR MAKES COMPETITIVE GAINS

Paris L'USINE NOUVELLE in French 24 Oct 85 Supplement pp 20-21

[Article by Jean Roume: "Usinor's Continuous Production of 'Super Sheet Metal'"]

[Text] It cost Fr 1.6 billion to install Montataire's continuous annealing line. Thanks to it, Usinor joins Europe's leading "super sheet metal manufacturers.

A vacuum treatment workshop for liquid steel in Dunkirk and a continuous annealing line in Montataire have been put into service. This makes not two, but three events for Usinor's slab products division in this September reopening. The third is that these devices supersede the most recent continuous production solutions on the new production line for automotive "super sheet metal" created in 3 years by the group from the Nord departement. This makes Usinor one of the very first European steel manufacturers capable of mass producing this product for car body manufacturers.

To Bernard Rogy, who is responsible for Usinor's slab products division, entering this still quite select club is not an end in itself. "Our modernization plan continues into 1986. Before then, there is still much to be done everywhere to improve our cost price, because our competitors are doing so." The chain has been forged, but will have to be made more solid.

Imparting the physical properties and competitiveness to the "super sheets" begins in the 4,000-metric-ton/day blast furnace No 2. "It is one of the most computerized in Europe and, since this spring, the world champion in coke economy: 329 kg per metric ton of cast iron, compared to 354 kg at the Japanese Fukuyama plant," sums up Claude Le Scour, the technician responsible for the smelting division. However, gains in quality and cost price still must be extended to the other units. "Likewise, Fr 900 million will have to be spent to renovate blast furnace No 4 (10,000 tons per day)," comments Bernard Rogy. "And it is equally urgent that we modernize our two coke plants."

There is another new link in the chain: the handling of the pig iron in 420-metric-ton ladles during its transportation to the steel mill. A desulfurization stand stabilizes the sulfur content at less than 0.005 percent as opposed a previous fluctuating range of from 0.8 to 0.10. The lowering of silicon and phosphorus to equally marginal levels is now in progress.

One billion French francs (380 million of which goes toward the ladle operation) has been set aside to upgrade steel plant No 2 for the "super sheets." Converters, continuous casting machines, and ladle treatment will receive new equipment. But the main event of this reopening will be the RHOB (Rheinstahl Heraeus Oxygen-Blowing) workshop for vacuum processing of steel being put into industrial operation: Fr 190 million for a capacity of 1.7 million metric tons annually. Liquid steel loses its hydrogen and nitrogen microbubbles. The rabbling elutriates the solid impurities and the oxygen-blowing results in a very low carbon level. "This is where the new steel types with strongly improved mechanical behavior under deep drawing and better resistance to intergranular corrosion take shape," specifies Michel Lahousse, project leader.

By the end of 1986, all the steel plant's units will be automated and linked to one another and to the plant's central computer. "This will be a great step toward real-time automation of the Dunkirk plant complex."

Reduced Production Time

After blast furnace No 2, the sheet mill was the second great renovation project launched in 1983. The old commutators were replaced by thyristors. From now on, the cylinders will be tightened by hydraulic transmission. All adjustments are now done in extremely short times and with incomparable precision. Computers are being replaced by "the latest word" in data processing methods, which should add new capacities to the structure, dimensions, and evenness of the sheet metal.

At Montataire (Oise), the cold-rolling complex and the Galvanor plant (coatings) simultaneously launched a Fr 1.6 billion plan to produce the necessary physical and chemical qualities for the approximately 1.3 million metric tons of substantially improved hot coils to be delivered each year.

The joining and modernizing of the fluxing and rolling complex (Fr 270 million) were accomplished in the past few months. The joining eliminates intermediate holding and inaugurates continuous rolling.

The cold mill train has just been completed by a fifth roll-housing with six loosened cylinders. As yet, there is no equivalent in Europe. This last tool gives an almost perfect evenness in the low gauge required by the "super sheets."

The new continuous annealing is indispensable in providing the cold rolled sheets with the high resistance which makes lighter car bodies possible. "This Fr 700 million investment also allows us to reduce repair time from one week to 48 hours," adds Jean Cenac, director of Usinor Montataire.

The third strong point is Galvanor's Monogal line (Fr 250 million). Using a procedure developed within the group, the Monogal line covers one side of the sheets with a protective zinc coating with the gauge and surface quality demanded by car manufacturers. "The complex at Montataire is presently one of the best European centers in its field," confirms Jacques Francais, director of the cold-rolled and coated slabs division at Usinor.

For Bernard Rogy, however, this last link of the chain needs more reinforcement: "Delivering 640,000 metric tons of sheets a year to the European automotive industry Usinor is its prime supplier and we owe it to ourselves to maintain that rank. With reference to Monogal, the demand for electrogalvanized sheets is on the rise. Montataire should also be able to ensure this production."

Is it impossible to ever satisfy Bernard Rogy? He is merely aware of the intensity of international competition that his division is going to have to face.

"If we can keep up our modernization investments without problems," he predicts, "we will not have to commit to any large structural expenses before 1990 or 1992, since our blast furnaces, steel plant No 2 and our strip mill will remain competitive until then, which is not the case for everyone in Europe.

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FRANCE'S SOLEMS ADDS AMORPHOUS SILICON TECHNOLOGY

Paris L'USINE NOUVELLE in French 7 Nov 85 p 106

[Article by Alain Dieul: "Amorphous Silicon: Solems Soon Reaching Industrial Stage"]

[Text] In order to face Japanese and American competition, Solems' managers, who are exploiting this sector together with Saint-Gobain, chose to help manufacturers "solarize" their products by specializing in the manufacture of customized photovoltaic cells.

Everything changes when amorphous silicon is used to transform solar energy into electric current! Indeed, until now, the only material suitable for the manufacturing of photovoltaic cells has been monocrystalline silicon, which, had two significant drawbacks: its high cost and its rigid form. By comparison, amorphous silicon, in spite of the fact that its output is limited to 4 percent, is generally thought of as a miracle formula. Because it is a good photoconductor, it can be deposited in very thin layers (on the order of 1 micron) on a high-diffusion material such as glass. The manufacturing process is very simple. The glass plate covered with tin oxide is introduced into a vacuum bell jar, after which gas is injected. An electric discharge disassociates the molecules from this plasma, thus depositing a layer of doped silicon onto the glass. This constitutes the active part of the photodiode.

A Different Glass Thickness for Each Application

To date, the amorphous silicon sector is being exploited only by Japan and the United States. In Europe, only Solems, a small subsidiary of, among others, Total Energy Development (CFP [French Petroleum Company]) and Saint-Gobain, has taken up the challenge. In order to face increasingly active competition from, for example, Chronar (this American company is going to set up a production line in Lens, in the Nord department, Solems managers chose to go further and help manufacturers "solarize" their products. "In order to reach this goal, we will have to manufacture customized photovoltaic cells. Because there are no other manufacturers today, all the machines that we have produced can already use glass of different thicknesses," Jacques Schmitt, scientific director at Solems, explains. This is important for production line flexibility because the

thickness varies according to the application. The quality of the glass, linked to the thickness problem, is fundamental for the survival of the amorphous silicon sector.

Solems is working with two types of glass. Thermal insulating glass used in the building industry is by far the cheaper. However, its thickness of at least 3 mm limits its use. Besides, it requires very strict quality control because its surface evenness and its resistivity, two essential parameters, are not very constant. "Certain deliveries lead to a 70 percent rejection," Jacques Schmitt says.

Conductive glass used for liquid crystals does not present the same problems. Its output in watts is greater, and its productivity is much higher thanks to its quality; its price, however, amounts to about Fr 1,000 per square meter. "If demand becomes substantial, we can expect this cost to diminish. If that did not happen, we would strangle," Jacques Schmitt declares. The ideal thing would be to have a product of intermediate quality. Glass manufacturers, however, speak in terms of metric tons, and they have to be persuaded to be interested in such tiny quantities!

Users' Wish: Higher Output Voltage

Modulating the intensity and the voltage supplied by the photovoltaic cell is also indispensable for adapting the product to requirements. "By enlarging the diode's surface, the supplied intensity increases while the output voltage remains constant. This is not sufficient to satisfy the majority of users, who want a much higher output voltage. This aspect of photovoltaic cell production requires the most expertise," Jacques Schmitt says.

This problem is solved by connecting several diodes serially, requiring cutting of the tin oxide layer, which is very hard. Several solutions have been considered. The use of lasers is now the subject of a joint study by CNRS [National Center for Scientific Research] and Solems. In spite of good results, factors like the high investment cost and the relative slowness of the procedure make it difficult to use this device in production.

The Japanese method attacks the tin oxide through serigraphy with resins. "This method is much too slow and, in our opinion, has no future," Jacques Schmitt says. Solems' solution is to separate the layer by means of an electric current. Thus, Solems' engineers have designed a machine which employs a thin plate which glides over the cell's surface triggering an electric discharge due to high voltage. The tin layer undergoes a kind of electrolysis and becomes an insulator under the thin plate. The machine is driven by a computer, which makes its use very flexible. In order to change the width of a photovoltaic diode, one only needs to change the data at the software level.

[Boxed Section] One Megawatt Annually in 1990

For two years now, Solems, established in 1981, has taken part in the French photovoltaic program. At present, this company, based in Palaiseau in the Paris suburbs, is still in an experimental stage. The current production line has a capacity of twelve to fourteen 20- by 20-cm plates per day. However, the products are not meant to be sold; their cost would be much too high. Above all they are meant to make potential customers sensitive to photovoltaic technology.

In the long run, sales will become one of the objectives of the second plant, although it will be primarily dedicated to research and development (moving automated devices from the scientific stage to the industrial stage). "This plant produces 50 kilowatts annually. It should soon reach 200 kilowatts and be adapted to the manufacture of personalized products," Jacques Schmitt confirms.

The year 1986 will be decisive. If market research studies prove to be accurate, a larger production unit will be needed. "A factory could be operational from 1987 onwards and reach a capacity of 1 megawatt per year in 1990," Xavier Jacquot, chief executive officer of Solems, declares.

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MICROELECTRONICS

FRANCE'S BULL ADJUSTS MARKET STRATEGY

Paris L'USINE NOUVELLE in French 14 Nov 85 pp 68-69

[Article by Jean-Pierre Jolivet: "Technical Data Processing: Bull Takes the Offensive"]

[Text] Paris--Computer Aided Design [CAD], artificial intelligence, image processing, etc. will be given priority by the number one manufacturer in French data processing industry. The objective is to realize one third of its turnover in these market segments within 4 years.

One year after the announcement of its first super minicomputer SPS-9--whose technology was acquired from the American Ridge Computer--Bull is opening an offensive on the real-time technical and industrial data processing markets. "We are going to adopt a market niche policy," explains Georges Grunberg, president of Bull-Sems. "Concentrating on the four new models of the SPS-9 line and on those of the SPS-7 family (mini-computers), we intend to attack the markets of CAD, artificial intelligence, image processing, and scientific data base management."

The leader in the French data processing business does not conceal its ambitions at all: By 1990, it wants its share from the technical and industrial field to increase from 20 percent to 30 percent of its turnover (estimated at Fr 16 billion this year). From 1986 on, the objective will be to reach a turnover of Fr 1 billion for the SPS line alone.

Bull holds several trump cards. First, the targeted markets are growing rapidly. The annual growth rate exceeds 20 percent in Europe and is even higher in France. Second, the technology acquired from the American Ridge Computer--the startup in which Bull holds 11 percent of the capital--remains very competitive. The RISC architecture used by Ridge Computer is mastered by only a very limited number of manufacturers, in particular the Pyramid company (to which Nixdorf is associated). Hewlett-Packard will announce its Spectrum series hardward in 1986. Also, IBM is still working on its Quik Silver workstation project using RISC architecture without giving a marketing date.

Competition Is Not a Bad Thing

Nevertheless, the game may well be tough for Bull. Despite considerable growth, the French market for technical and industrial data processing remains

overcrowded. This is all the more so because the American competitors--DEC, Hewlett-Packard, Data General, Prime, Perkin Elmer, Sun Microsystems, or Apollo Computer--are now joined by Matra Datasysteme. Thanks to the technology of the Norwegian company Norsk Data, Jean-Luc Lagardere's group has affirmed its intention to function as a French center for technical and industrial data processing. It is also encouraged by the contract won in competition with Bull to supply CNES [National Center for Space Studies] with super minicomputers (Fr 200 million over 5 years). So, is there still room for two French competitors?

To this question Georges Grunberg answers: "The competition with Matra-Norsk Data is not a bad thing, especially as we are backing up our hardware offer with a policy of cooperation with SSII's [Data Processing Services and Engineering Companies] for third-party software. In this domain, we are ahead of the pack."

This strategy is enabling the Bull group to position itself in the CAD market. The company is announcing a workstation--the SPS-9-30 model--which will compete directly with DEC's VAX-780 85 and 8600, as well as with the micro VAX and with the workstations of Sun Microsystems or Apollo Computer (in single-user version). Beginning next year, Bull will round out its offerings with SPS-7 workstations using the Motorola 68020 32-bit microprocessor (on its way to becoming the standard for real-time data processing) and integrating some graphics functions.

However, Bull has already reinforced its cooperation with SSII's in the field of third-party software, and it has about 60 packages listed in its catalog. The objective is simple: to corner significant market shares in a limited number of niches--electronic and mechanical CAD, schematics, cartography, etc.--by offering a complete range of applications. "Because," Frances Lorentz, its general manager, emphasizes, "Bull--which is finally getting out of the red this year--has to strengthen its positions before enlarging its range of activities."

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MEETING REVEALS SOME SUPPORT FOR EUREKA LINK TO MILITARY

Duesseldorf VDI NACHRICHTEN in German 18 Oct 85 p 10

[Article by H. Frey: "Armament Research: Eureka in the Wake of SDI? European Research Program Not Quite Free of Military Goals"]

[Text] The American President's defense initiative, which has become commonly known as SDI, is up front about serving military goals. The Europeans are trying to meet the technological challenge posed by SDI with the Eureka project, which is at the present oriented primarily toward civilian goals. At a discussion on SDI and Eureka sponsored at the end of September by the Academy for Political Education and Future Form, reg. Asso., in Tutzing, it became clear, however, that the French at least are not pursuing exclusively civilian goals with the Eureka Project.

The American Strategic Defense Initiative is an attempt to employ as yet to be developed technologies to destroy enemy intercontinental ballistic missiles on approach--to destroy so many of them so early that perhaps, according to the vision of the American president, it would be possible to catch them all.

Since both military blocks are faced off against each other in Europe and of necessity hold each other in check with weapons systems other than intercontinental rockets, the military, the politicians, and the arms industry also all agree that a new arms technology is needed for protection from this kind of threat. Consequently, the military and the arms industry are pressing for cooperation between the European allies as well as with the USA. In their opinion, the Eureka research and engineering program can be seen in close connection with a European defense initiative.

The two super powers began already 30 years ago to look for possible ways to shoot down nuclear-armed rockets before they would reach their own territories. Hence President Reagan didn't invent "Star Wars"; he only brought it up to date and emotionalized it by propagating it as the "solution" to atomic annihilation.

Reagan has asked for 26 billion dollars for the period from 1985-1989 to finance SDI. So far Congress has approved 4 billion dollars for 1985-1986, including 1 billion alone just for research into new laser systems. For Europeans these are nearly astronomical figures.

It would be easy to answer the question whether Western Europe should take part in the Americans SDI research--if the advocates' argument were the only

consideration: SDI is not just supposed to increase military security, it is even supposed to result in the elimination of all nuclear ballistics missiles in the long run. And finally--this is an extra carrot dangled in front of the Europeans--participation in the space defense system is also supposed to induce a quantum leap for science and technology in the old continent.

Gerd Schmueckle, former Deputy Supreme Allied Commander for Europe, spoke out in Tutzing for European participation within the framework of Eureka. In his opinion, the Americans will only accept the Europeans as equal partners if they supply funding for Eureka at least equal to what the Americans intend for SDI, and in addition if they would speak with one mind with the Americans. However, Schmueckle is correct in doubting that this can be achieved. Hence he is pleading more for a kind of European supplemental program with a supposed goal of increasing the proportion of purely defensive weapons in the Nato alliance in comparison to the number of offensive weapons. Defensive weapons are not only cheaper; a high proportion dedicated to a defense concept would have a confidence building effect. In the past no one has been able to achieve this kind of concept in the Nato Alliance because resistance from the armaments industry, which wants primarily to sell expensive and highly complicated weapons systems, is too great.

It is interesting in this context that Schmueckle also noted, "that the Soviet Union possesses a higher ratio of defensive than offensive weapons," in addition to the comment that "Nato is a frightfully awkward allied structure, which is also extremely awkward to reorient to a new defense concept."

Then a representative of the armaments industry illustrated how the weapons system cited by Schmueckle should be developed within a European framework. Starting with smart mines, which lurk behind hedges waiting for tanks, to tanks with high-performance laser cannon and remote-controlled drones, to satellite-controlled interceptor rockets, all the "good and expensive" stuff was well represented. The overall scenario posed the question as to what role remains for humans to play with such weapons systems. It looks like the war of the future will only take place on the video screens in the command bunkers.

Monique Garnier-Lancon, Vice President of the European Institute for Security in Paris and political security advisor to Jacque Chirac, presented the French view on Eureka. In France they see Eureka as a European defense initiative counterpart to the SDI project. Thus the French position is a clear contrast to that of the Federal Republic where Eureka is seen as a purely civilian research and engineering project. Interestingly enough, one main research point in the Eureka concept presented by Madame Garnier-Lancon involves "the psychology of the masses and of the individual." Monique Garier-Lancon's comment: "if the Communists don't conquer us militarily, they will to it psychologically," leads one to believe that this research emphasis is supposed to break down enemy images and hence encourage "moral fitness."

Reflecting on the meeting, it is apparent how closely and almost unassailably scientists, engineers and military people work together, but above all, how strongly the armaments industry is capable of promoting its own interests in this frame of reference. It was also obvious how uncritical primarily the

technical specialists attending the conference were in accepting the strategic military concepts--certainly with the ulterior motive that military research and development is the motive force behind the technical progress which should guarantee jobs and income. They think too seldom of an increasing weakness which affects all highly complex technical systems: The functions of a multi-layered defense system based on the most modern technology must be carefully and reliably attuned to one another. Human decisions are no longer capable of controlling the use of weapons systems like those included in SDI and possibly in Eureka. Humans have to surrender control to the computer; politicians have to delegate the power of decision to machines, and mankind becomes the handmaiden of the technical apparatus, which alone has the power of decision.

Is this what the much-acclaimed technical progress looks like? Instead of contemplating ever-more complicated weapons systems which degrade human beings to objects, should we not rather think about the content and background of something Research Minister Riesenhuber said, "Technology after all is not an end in itself, but rather an instrument to improve human living conditions"?

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SCIENTIFIC AND INDUSTRIAL POLICY

NORWAY'S PROJECT COORDINATOR FOR EUREKA INTERVIEWED

Oslo AFTENPOSTEN in Norwegian 28 Dec 85 p 7

[Article by Georg Parmann: "Portrait of the Week: Inge Johansen: Knowledge Is What We Have a Short Supply Of"]

[Text] We will hardly ever get to see Director Inge Johansen running naked around in the streets and shouting, "Eureka! Eureka!" His unassuming style of leadership dictates that he will use other means of marketing the new joint European research organization. When Archimedes of old sat in the bathtub and suddenly discovered the law of buoyancy, he ran out into the street and shouted his legendary "Eureka! I have found it." But Johansen will be glad to shout loudly about Eureka if it is necessary to win sympathy for the new interesting European joint research venture.

When the administrative director of the Norwegian Council for Scientific and Industrial Research (NTNF) has been named Norway's project coordinator for Eureka his appointment book will become still thicker. Inge Johansen is the daily leader of the biggest research council in the country, is board chairman of Statoil, and has a board appointment at the ASEV [Business Establishment and Development, Inc.] industrial development company in Trondheim. His close staff members have a tremendous job in delivering papers around the world so that they can be discussed between two meetings or at a stop. But the last two days of the week are kept sacred.

When Inge Johansen left the presidency of the Norwegian Technical College in Trondheim nearly a year ago and became a long-distance commuter to Oslo, he promised himself and his family to keep weekends free from work. Actually, his wife says that she now sees just as much of her husband as she did when he lived and worked in Trondheim. Now he gathers new strength together with his family on weekends. Attendance at church is one fixed point.

The work week begins on the plane to Oslo on Monday morning. Eureka is among the matters which occupy him a lot these days. Here he sees an opportunity to attack tomorrow's problems in a constructive manner. But Eureka will give way to just a few selected research projects. For this reason it is necessary to work on a broad front in technological and scientific research circles here at home. The best ideas and research projects are being supported.

"I am happy about the expressed positive attitude toward research we have seen from political quarters in recent times. There is a growing understanding of the fact that innovation in Norwegian industry and business is dependent on advanced research. But I am not completely sure that it has dawned on most people what extensive changes are actually taking place."

"Look, for example, at the demand for labor. Formerly a skilled worker was a firm's most important resource. Today there are many firms which have over half of their work force consisting of people with a university and college education. For example, in the Norsk Data success firm 70 percent of the employees have been educated at universities or colleges. We find such examples in most strong-growth industries today," Inge Johansen says.

"It is degreed engineers, graduates in science, doctors and engineers who will form the labor force of the future's firms. But too little has been done here at home to increase education capacities. It does not help to send some students abroad for a few years--we have to rearm here at home. I think it is frankly a shame to see young people full of initiative, prepared to go after a higher education without getting a seat in school."

"We cannot let research go in order for industry to get more of the degreed engineers it needs. The high-technology industry does not need just degreed engineers in order to be competitive. People with research competence at a high level are also needed."

"For this reason NTNF is deliberately advocating building up the training of doctoral candidates through basic research assignments. That we have a shortage of competence at all levels in all the fields which the government has designated as venture fields for Norwegian research I do not believe has sufficiently dawned on the politicians. That knowledge is in short supply here at home we can see, among other things, from salaries. While a degreed engineer in Sweden can expect a beginning salary of 9000 kroner a month, the salary in Norway is 4000 to 500 [as published] kroner higher. It should be unnecessary to say that this also affects the country's ability to compete," the NTNF director points out.

However, Inge Johansen admits that the politicians do have a theoretical understanding of this problem. But what we are talking about is tomorrow's problems. Unfortunately, politicians all too often have difficulty enough in handling today's. He would like to caution against weakness here and uses the Netherlands as an example of how it can go when short-term prosperous growth is prioritized over long-term building up of competence. The Netherlands had money from gas production on the continental shelf but did not use it to prepare itself for a time when the gas flow diminished. One result is that the country is among those with the highest unemployment in Europe today.

Inge Johansen admits that research can seem remote to Norwegian industry and management because it is long-term and people do not feel affected by it. But the day the lack of foresight has consequences for our jobs, then it is very difficult to regain what was lost.

[Question] Then it surely must be even more difficult to convince people that we should take part in something as remote as the Eureka European research program, must it not?

[Answer] "Fortunately the politicians have been very quick to comprehend what Eureka is and are supporting it. The main objective is to shorten the path from research and development to the market, so that European industry does not fall behind in relation to its competitors--the USA and Japan. The initiative for research projects in the Eureka joint venture must come from industry and business itself. But in order to bring Norwegian industry into such a joint venture we have to have something to attract with. For this reason, if Eureka is to be successful public money must be put into it also, for loans and support. It is on this point that I am concerned about having to shout loudly in order to arouse the politicians' understanding," Johansen says.

And raising his voice in order to get attention is not one of Inge Johansen's habits. He has a softspoken style of leadership. It is firm, but not authoritarian. He is quick to come to the point and makes decisions when the arguments have been heard, and short-term ulterior motives do not influence him. This is not to say that Inge Johansen does not listen to his staff members. On the contrary, he is very open to technical arguments and knows how to call on the competence which exists around him. These qualities also come in handy in his chairmanship of Statoil's board of directors.

"The job at Statoil requires perspective and special insight more than the knowledge of details. My background in terms of research and education for this reason should not be any worse than other skills for taking an assignment in Norwegian industry."

The 57-year-old chairman of the board has a solid technical background with his electronics education from the Norwegian Technical College. He became a doctor of engineering in 1957 and a professor of electric power engineering in 1959, when he was only 31 years old. He was president of NTH [Norwegian Technical College] from 1976 to 1984. He has had the chairman of the board appointment at Statoil for nearly two years. Here he is taking part in developing the State oil company both on land and in the international market.

"Important features of the further development of Statoil will take place in part on land by the sale of refined products. It is easy enough to sell crude oil when the demand is high and prices are rising. But when it is a seller's market it is important to control all parts of the market. For this reason we are now expanding with marketing preparations for refined products in Sweden. We are also extending our financial commitment on the crude oil side. We are entering promising projects abroad. We are already involved on the Dutch shelf, we are applying for rights in Denmark, and are already partly involved in projects in China," Johansen relates.

It is not just in major industrial and research contexts that Inge Johansen is involved. There is a newly established company in Trondheim, A/S Etablering og Virksomhetsutvikling [Business Establishment and Development,

Inc.] (ASEV), where he has a board appointment. ASEV has the objective of helping new firms to be set up which have their origin in technological research circles. Since its establishment a year and a half ago, 12 to 14 new knowledge-based firms have seen the light of day with their birth aided by ASEV, and he readily talks fervently about this type of purposeful work to get new firms established.

Although Inge Johansen is glad to take part in making decisions in the contexts in which he is involved, he has no problems with being content with a position as an ordinary rank-and-file member. This is the case at the Free Church in Trondheim, for example, which he changed over to a few years ago. Before this time he was active, also in a church context, as the chairman for many years of the parish council in Heimdal.

The changeover to the Evangelical Lutheran Free Church was no big step, among other things, because his wife had grown up with it. "After long consideration I became convinced that the Church and State should separate; therefore, it was easy to take the consequences and change over to the followers of the free church. I wish the Norwegian Church all well, but it is the sheerly in-principle aspects of the national church arrangement which I do not find right. The Church must be free in its testimony towards the State," Johansen says, who himself does not believe in any speedy separation between the Church and State here at home.

In addition to deriving spiritual inspiration from his church, Inge Johansen likes to derive inspiration from nature, and first and foremost from the family's sanctuary in Kvikne. Fortunately, his area was not affected by the Orkla development; otherwise the electronic engineer could perhaps have come into conflict with himself. Although, we have no doubt that in this context too he would have managed splendidly to separate private interests from his professional involvement.

And it is precisely this solid professional involvement which has made Inge Johansen a new and important source of inspiration at his main job at NTNF. He entered the research field when it was in the middle of an extensive process of becoming independent, in which united research institutions were to be converted into independent establishments. This process is on the point of being completed, and he has his share of the credit for the fact that the slight uneasiness which characterized some institutes has now been turned into new optimism and push. It is with the same optimism that he tirelessly, day after day, is working for Norwegian business and management to get constantly better research programs in the field of science and technology.

8831
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SCIENTIFIC AND INDUSTRIAL POLICY

FRG GROUP SEES 'LIMITED' SPIN-OFFS FROM SDI TO CIVIL SECTOR

Duesseldorf HANDELSBLATT in German 3 Sep 85 p 4

[Text] On "Anti-War Day" the SPD and the DGB have again called on the federal government not to participate with the U.S.A. in the Strategic Defense Initiative. The Economic and Social Science Institute (WSI) of the DGB attempts to demonstrate in a study that "space weapons" will not bring any spin-off technologies for the civil sector.

First the German government wants to wait to see what results the 30-man delegation led by Horst Teltschik, the Chancellor's foreign policy advisor, brings back from the U.S.A. on 13 Sep. The group travels to Washington this Wednesday (4 Sep). As the government spokesman Mr. Ost explained, the group is to sound out ideas in the United States about arrangements concerning industrial cooperation, particularly the property and usage rights and questions about industrial espionage security. Only after all questions have been satisfactorily answered will the German government consider "the form and contents of an eventual official government participation" in the SDI.

The CDU Defense Working Group came out in favor of entering into an independent European Defense Initiative (EVI). Its chairman, Willi Wimmer, announced to journalists that in conference over the defense budget in the parliament, the Union (CDU-CSU) would push for research and development funding for defense against short-range missiles, cruise missiles, and long-range weapons.

In any case, there must be an end to "simply just accepting whatever has already been planned out in Paris or Washington", and to the "lamenting over what the U.S.A. plans to do," stated Wimmer after his return from talks with American defense politicians in the U.S., where the American "Strategic Defense Initiative" (SDI) was also discussed.

The Economic and Social Science Institute states in the justification for its thesis that "space weapons" will bring no advances for civilian industries, such as:

> The aerospace industry - with less than 100,000 employed, a very small branch of the air industry,and which has up to 60 % of its sales to the

armed forces - has received the lion's share of public research and development monies (between 21 and 52 % in the period from 1967 to 1979). Sensible projects of practical application in the civilian sector are as good as non-existent. The civilian showpiece of the German aerospace industry, the Airbus, which has received so much praise because of its technology, is an enormous loss leader in an economic sense. Up until now, not even half of the sales have been made which are necessary to cover the production costs.

The often-cited spin-offs from military development for civilian products is actually rather low, or signifies a nearly grotesque round-about way towards the development of economically useful products: technology developed for military purposes is far too expensive for civilian products, which are produced on a cost/benefit basis, because the "baroque pieces of armaments" are highly complex and technically overdeveloped.

Finally, a comparison between western industrial countries, including Japan, shows a negative correlation between military expenditures and economic growth: the countries with the highest military expenses had on the average lower growth rates in the productivity of manufacturing industries. A further comparison between the U.S.A. (where currently half of all public funds for research and development is going to military purposes, and this is increasing) and Japan (where only 2 % of the public R&D funds are going to military research) clearly indicates that international competitiveness is not positively affected by increased efforts in the armaments field.

The WSI draws the following conclusion from its investigation: it is more sensible to set the priority in favor of civilian technology instead of the hope for civil trickle-down products from the military sector.

13071
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SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH CIVIL R&D BUDGET FOR 1986 UP 8.2 PERCENT

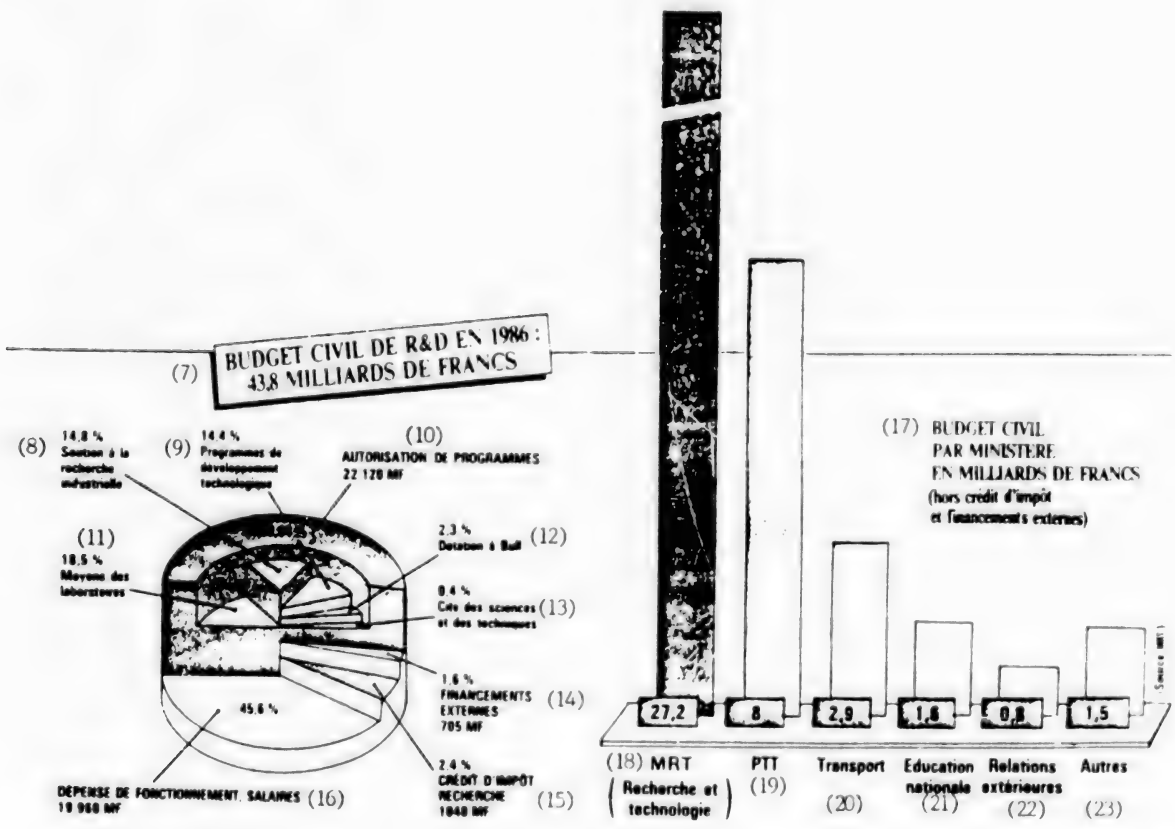
Paris INDUSTRIES & TECHNIQUES in French 1 Nov 85 p 27

/Text/ Voluntaristic research and development budget for 1986. Increased by 8.2 percent over 1985, the Civil Research and Technological Development Budget (BRCD) amounts to Fr 42 billion and even reaches 43.8 billion if it takes into account the budget provided for the research tax credit (Fr 1,040 million) and the outside finances (Fr 705 million).

A budget which figures, according to the ministry, "in the dynamics of a constant effort, with the objective of devoting 3 percent of the national wealth in research and technological development at the end of the decade." A level comparable to that of the United States and Japan.

This effort is being pursued in both public and private research. The development of public research is based on a policy of employment (605 researchers and 120 research engineers will be hired in 1986 and new educational measures will be implemented) and a policy of equipment, with two priorities: medium-weight equipment and computerized calculating means. But it is also a question of dynamically activating industrial research. On this subject, it is necessary to emphasize the development of positions directly involved in industry. The budgetary cost of the tax credit is fixed at Fr 1.04 billion in 1986 compared to Fr 500 million in 1985; the portion of FRT credits allotted to the industrial sector should amount to 53/54 percent (50 percent in 1985, and 48 percent in 1984), bearing in mind that a portion of the FRT had been transferred to the PTT budget in the framework of electronic processing; lastly, the budgetary grant of the National Agency for the Implementation of Research (ANVAR) is in progression by 8.8 percent (ordinary expenditures plus program authorizations). But, in addition, a significant portion of the sums spent on public organizations reverts to businesses, whether for purchase of equipment or for research contracts. Thus, in 1983 (latest known figures) the government financed 57 percent of research but performed only 43 percent. Inversely, businesses provided 43 percent of the financing (20 percent for the private sector alone) and 57 percent for the performance (24 percent for the private sector). According to the Department of Analysis of the National Research Potential (of the Ministry of Research and Technology--MRT), it follows that the research effort of businesses is financed approximately 20/25 percent by the government, and essentially by the Ministry of Defense which, alone, represents 70 to 75 percent of this financing (in the direction of the electronic, aeronautical

and space sectors), followed by the PTT with 10 percent (electronics and telecommunications). A large portion, less than in the United States (about 30 percent) but more than in West Germany (about 17 percent) and which above all bears witness to a qualitative change recorded only in the past several years: public research organizations are increasing the number of cooperative agreements (particularly framework agreements) with the private sector.



Key:

1. Research tax credit in millions of francs.
2. Research and technology fund (MRT).
3. Number of businesses involved.
4. 85 (Estimate).
   86 (Forecast).
5. Portion allocated to industry (as of 1985 the funds to be used for electronics are transferred to the PTT budget, Fr 210 million in 1986).

6. ANVAR assistance.
7. Civil R&D budget in 1986: Fr 43.8 billion.
8. 14.8 percent support of industrial research.
9. 14.4 percent programs of technological development.
10. Authorization of programs Fr 22.120 million.
11. 18.5 percent Laboratory means.
12. 2.3 percent Grant to Bull.
13. 0.4 percent City of Sciences and TEchniques.
14. 1.6 percent Outside finances Fr 705 million.
15. 2.4 percent Research tax credit Fr 1.040 million.
16. Operations, salaries expenditure Fr 19.960 million.
17. Civil budget by ministry in billions of francs (excluding tax credit and outside finances).
18. MRT (Research and technology).
19. PTT.
20. Transportation.
21. National education.
22. Outside relations.
23. Others.

13112/12228
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SCIENTIFIC AND INDUSTRIAL POLICY

TAX CREDITS, RESEARCH POSITIONS IN FRENCH 1986 R&D BUDGET

Paris AFP SCIENCES in French 31 Oct 85 pp 1, 3, 10

/Excerpts/ Paris--On 26 October, the deputies adopted the 1986 research and technology budget by voting credits which should increase the National Research and Development Expenditure (DNRD) to 2.4 percent of the gross domestic product (PIB). The DNRD encompasses payment credits, ordinary expenditures and the inherent resources of public organizations and industry (if the latter applies) less the value-added tax. In 1985, this rate was 2.25 percent.

In all, expressed in figures, the total R/D effort of the country would represent some Fr 115 billion.

Only the Socialists approved this budget, criticized at the rostrum by the very rare speakers of the opposition and by the Communists.

The credits opened for 1986 amount to Fr 26.229 billion, or an increase of 12.72 percent; but the Civil R/D Budget (BCRD) will be Fr 42.084 billion, or an increase of 8.2 percent.

Creation of Positions in Public Research Establishments

In 1986, there will be 1,400 new positions (compared to 1,008 in 1985, including 400 integrations), comprising 725 researchers and research engineers (i.e., 605 researchers and 120 research engineers) and 675 other engineers, technicians and administrative personnel (ITA).

Of the 605 new research positions, 576 will go to scientific and technological-type public establishments; 99 will go to industrial and commercial-type public establishments.

Thus, an average employment rate of 5 percent is assured.

Of the 675 ITA positions, more than half are design engineers or assistant engineers.

The Tax Credit

Established by the 1983 finance law, the tax credit (which provides a reduction of the corporation tax or the tax on business revenue at the level of 25 percent of the increase in volume from one year to the next of their research effort) is considerably improved in the bill presently under discussion relative to research and technological development: on the one hand, the tax credit is increased from 25 to 50 percent; on the other hand, its ceiling, which was Fr 3 million, rises to Fr 5 million; and finally, the duration of the validity of the measure is extended by 1 year (through 1988).

Under these conditions, the fiscal expenditure resulting from the tax credit should research Fr 1,040 million for 1986. This doubling of the rate and the raising of the ceiling should not contradict proven success of this "simple, general, automatic and nondiscriminatory" mechanism, according to Mr Michel Charzat (PS Paris), special chairman of the R/D budget.

According to the Ministry of Research and Technology (MRT) 1,600 firms opted in favor of the research tax credit in 1984, thereby representing a total tax credit of Fr 385 million. The average amount per firm was, therefore, Fr 0.24 million.

In all, it is possible to estimate that at least 2,000 firms will have benefitted from the tax credit before the end of 1985 and that the budgetary cost of the measure for that fiscal period will exceed Fr 420 million.

The tax credit seems to have interested mainly the most dynamic firms and the small and medium-size businesses having fewer than 500 employees (61 percent of those declaring represent 30 percent of the fiscal expenditure).

The main sectors benefitting are, in decreasing order: automobile construction, chemical industry, data processing, pharmaceutical industry, electrical equipment, electronics, machinery.

In addition, the majority of the businesses benefitting from the tax credit are not those which resort to large direct budgetary assistance. The tax credit has thus rearched new categories of businesses, thereby playing a role of spreading research, which is essential in a country like France that suffers from an excessive concentration of research expenditures, still according to Mr Charzat.

Balance Sheet of Positions Created Since 1981

(excluding equalizations)

	Researchers or Managerial		ITA or Managerial		Total	
Years	Number of Positions Created	Percent Increase (%)	Number of Positions Created	Percent Increase (%)	Number of Positions Created	Percent Increase (%)
1981	564	3.5	586	1.5	1,150	2.1
1982	688	4.1	899	2.3	1,587	2.8
1983	674	3.9	823	2.0	1,497	2.6
1984	334	1.9	376	0.9	710	1.2
1985	536	3.0	174*	0.4	710	1.2
1986	605	2.9	795**	1.8	1,400	2.1

*Including 110 positions for the City of Sciences and Industry.
**Including 160 positions for the City of Sciences and Industry.

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SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH UNIVERSITY RESEARCH BUDGET INCREASED FOR 1986

Paris LA TRIBUNE DE L'ECONOMIE in French 10 Dec 85 p 17

[Text] Research is receiving privileged treatment in an austere 1986 budget. University research is even better off, with program authorizations in the Ministry of National Education totaling 1.25 billion francs, or 12.6 percent more than in 1985.

Research in higher education--with 40,000 teacher-researchers and 4,000 teams in about 100 establishments--represents one-tenth of the R&D work done in France and one-fourth of all government research.

Minister of National Education Jean-Pierre Chevenement remembers his stint in the Ministry of Research and Development. Among his priorities are the development of technological research in schools and IUT's [University Technology Institutes], cooperation between university laboratories and PMI's [small and medium-sized industries], the training of students for research, and the training of engineers through research.

The program calls for developing poles for "the training of engineers through research in technologies for general dissemination." Eight poles have been set up to date: materials in Paris and Grenoble, artificial intelligence in Grenoble, biotechnology in Toulouse and Compiegne, chemical engineering in Nancy, robotics in Toulouse, and industrial control in Compiegne. About 10 more will be established in 1986, with the final number to be about 40. The purpose is to bring about a sizable increase in the number of engineers with experience in research--only 5 percent of the annual crop of engineers goes through a doctoral program.

Educational research is to be reorganized at the same time: a public subsidiary group will bring together the teams concerned from the CNRS [National Center for Scientific Research], CESTA [Center for the Study of Advanced Systems and Technologies], and the universities as well as the INRP [National Institute for Pedagogical Research], the National Conservatory of Arts and Crafts, the National Agency for the Development of Continuing Education, and the Center for Study and Research Concerning Qualification.

Lastly, and in another connection, Hubert Curien and Jean-Pierre Chevenement have just announced the establishment of a National Scientific and Technical Information Agency (ANIST) in Nancy. It will be responsible for organizing access to information, developing scientific data bases, and disseminating specialized products internationally.

11798
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SCIENTIFIC AND INDUSTRIAL POLICY

NEW FRENCH VENTURE CAPITAL FIRMS ESTABLISHED

Paris LA TRIBUNE DE L'ECONOMIE in French 14-15 Dec 85 p 12

[Article by Michel Cahier]

[Text] After Saint-Gobain, the leader in the French venture capital fund attached to the European holding company Euroventure BV, it is now the turn of the CGE [General Electric Company] and the Lyons Credit Bank to announce the establishment of new organizations.

For its part, the CGE will soon launch a European fund with an initial 100 million francs to be used exclusively for financing high-technology projects by European PMI's [small and medium-sized industries]. The name of the fund has not yet been decided on, but it is probable that a large nationalized bank will sit on its board.

Following what is currently the most usual pattern, the fund's management team will be given full authority: it should be completely independent and interested in the results, and that, subject to discussion concerning practical details, represents a considerable innovation in France. It will also pursue a very active policy of participation, notably by involving its management team in the management of affiliated firms.

That being said, the goal being pursued--and the CGE does not deny it--is to establish a "window" for technological surveillance--a traditional policy for the group that is known for its skill in buying up good PME's [small and medium-sized firms] with promising technology and good markets.

Lastly, the Lyons Credit Bank is expected to announce on Saturday morning (14 December) that it is launching a new organization to finance the startup of firms. Known as Inno-Lion, the new organization's initial capital will total 35 million francs. We recall that in 1984 the Lyons Credit Bank established its Lion Expansion PME, which buys into firms whose sales do not exceed 50 million francs. Establishing firms and financing their early growth accounted for 43 percent of the operations carried out as of last 31 October.

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SCIENTIFIC AND INDUSTRIAL POLICY

NETHERLANDS 1986-1990 R&D BUDGET

Paris AFP SCIENCES in French 31 Oct 85 p 20

[Article: "Priority to Research But a Constant Budget"]

[Text] For the past several years, the Netherlands has devoted considerable energy to research. Despite its limited budget, this research effort's combination of considered choices and clearly defined priorities, supported by a creative university framework and an innovative industrial base, has produced beneficial scientific results in more than one field.

Ministry of Education and Science officials readily concede that Dutch research represents approximately 1 percent of the world's overall research effort. The government's 1985 budget for scientific research, including funds allotted to universities, was 3.95 billion guilders (about 16 billion francs). When adding thereto the private universities and business firms, this figure rises to 8.67 billion guilders. Research budget estimates for 1986 include 4.07 billion guilders funded by the government and a total of 9.03 billion guilders funded by all sectors combined. This sum represents 2.13 percent of GNP compared with 2.1 percent in 1985.

The scientific research budget's changing share of GNP reflects a continuous rise from 1.96 percent in 1980 to 2.13 in 1986. Dutch observers note, however, that when this change is viewed within an international context, it is seen that Dutch research and development outlays alone increased from 0.9 to 0.92 of GNP between 1975 and 1983 (figures reduced to an index number), whereas they changed from 1.02 to 1.12 on the average for the European Community during the same period, from 1.23 to 1.15 for the FRG, from 1.17 to 1.45 for France, from 1.24 to 1.18 for the United States, and from 1.27 to 1.36 for the United Kingdom. On the international scene, however, the research effort is principally within the industrial field.

Sectors specifically earmarked for funds in the Dutch Government's budget include:

a. Technological research (Ministry of Economy's plan for promotion of innovation): 593 million guilders in 1985 and 726 million guilders per year from 1986 to 1990;

b. Data processing technology: 43 million in 1985 and 52.2 million from 1986 to 1990;

c. Environment: 115.3 million in 1985 and 124 million from 1986 to 1990;

d. Marine research: 19.1 million in 1985 and 19.9 million from 1986 to 1990;

e. Space: 106.2 million in 1985 and 137.3 million from 1986 to 1990;

f. Other basic research: 398.1 million in 1985 and 431.1 million from 1986 to 1990.

Those sectors whose budgets have been cut include:

a. Public works: 33.7 million guilders in 1985 and 26.9 million guilders per year from 1986 to 1990;

b. Transportation: 35.1 million in 1985 and 32.6 million from 1986 to 1990;

c. Health (part thereof): 105 million in 1985 and 100.4 million from 1986 to 1990;

d. University research (reorganization): 1.795 billion in 1985 and 1.783 billion from 1986 to 1990.

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